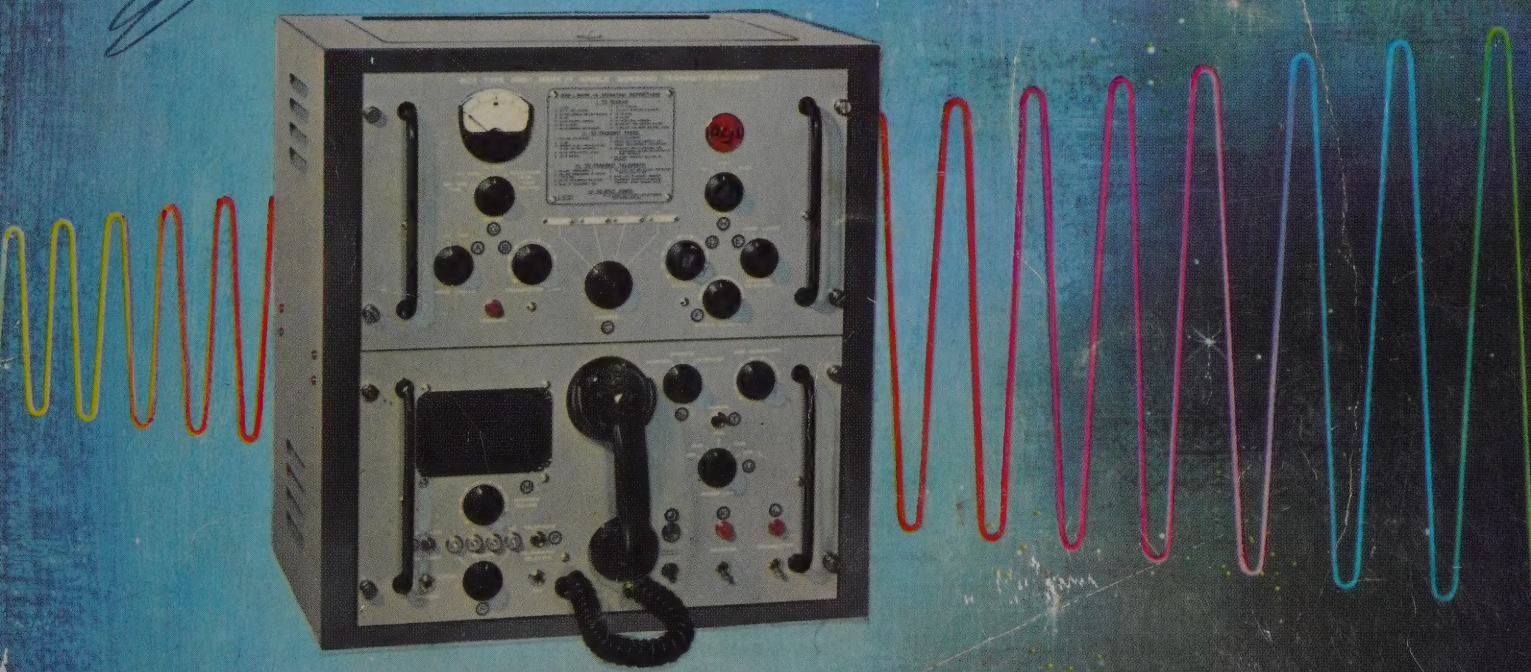
INSTRUCTION BOOK

SSB-1 *mark IV*

Single Sideband Transmitter/Receiver



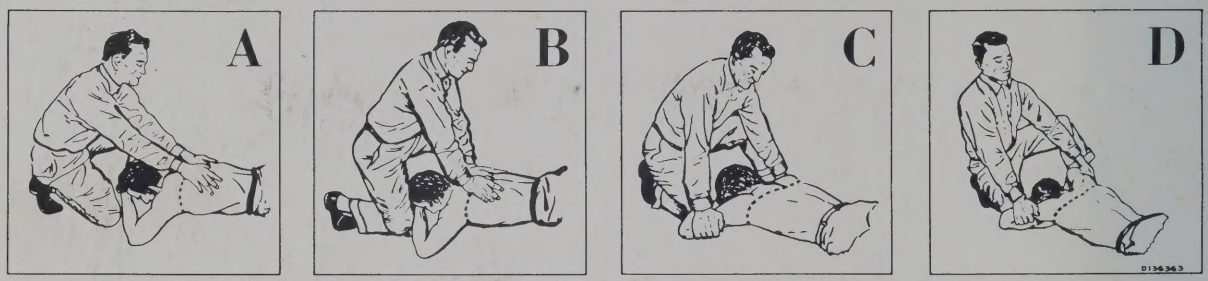
RCA RADIO CORPORATION OF AMERICA

WARNING

ELECTRICAL OR MECHANICAL SERVICING OF THIS EQUIPMENT SHOULD BE ATTEMPTED ONLY BY QUALIFIED TECHNICAL PERSONNEL AUTHORIZED FOR SUCH WORK. OPERATION OF THIS EQUIPMENT INVOLVES THE USE OF VOLTAGES WHICH MAY BE DANGEROUS TO LIFE.

FIRST AID IN CASE OF ELECTRIC SHOCK

1. PROTECT YOURSELF with dry insulating material.
2. BREAK THE CIRCUIT by opening the power switch or by pulling the victim free of the live conductor. DON'T TOUCH THE VICTIM WITH YOUR BARE HANDS until the circuit is broken.
3. START ARTIFICIAL RESPIRATION IMMEDIATELY, SECONDS COUNT. Do not wait to look for help, to loosen clothing, to warm the victim, or to apply stimulants.



4. LAY VICTIM ON HIS STOMACH, preferably with head downhill.
5. CHECK MOUTH FOR OBSTRUCTIONS, remove foreign objects, pull tongue forward.
6. PLACE VICTIM'S FOREHEAD on his crossed hands, face down.
7. KNEEL AT VICTIM'S HEAD on either knee. See (A)
8. PLACE HANDS, fingers spread with thumbs about two inches apart, heels of hands below line connecting armpits. See (A)
9. WITH ELBOWS STRAIGHT, ROCK FORWARD slowly until arms are vertical. See (B) Do not apply more than 35 pounds pressure.
10. ROCK BACK SLOWLY to release pressure.
11. GRASP VICTIM'S ARMS just above elbows and continue backward. See (C)
12. LIFT ARMS until tension is felt. See (D)
13. LOWER ARMS to complete the cycle.
14. AFTER TWO SECONDS, START AGAIN with step 6.
15. REPEAT THE CYCLE 12 to 15 times per minute.
16. WHILE ARTIFICIAL RESPIRATION IS CONTINUED, HAVE SOMEONE ELSE:
    (a) Loosen the victim's clothing. (b) Summon medical aid.
    (c) Keep the victim warm.
17. DON'T GIVE UP. Continue without interruption until the victim is breathing without help or is certainly dead.
    Four hours or more may be required.
18. REMAIN IN POSITION after victim revives. Be ready to resume artificial respiration if necessary.
19. DO NOT GIVE LIQUIDS WHILE VICTIM IS UNCONSCIOUS.

TYPE

SSB-1

MARK IV

INSTRUCTION BOOK

SELECTABLE SINGLE SIDEBAND COMMUNICATIONS EQUIPMENT

(MI-22803)

3 TO 15 MC

100 WATTS PEAK ENVELOPE POWER

Prepared by

RCA SERVICE COMPANY

A Division of Radio Corporation of America

FOR

RCA INTERNATIONAL DIVISION

RADIO CORPORATION OF AMERICA

30 Rockefeller Plaza, New York 20, New York, U. S. A.

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Section I

TECHNICAL SUMMARY

GENERAL

TYPE OF OPERATION

Simplex (Push-to-talk) telephone or telegraph.
Optional voice operated keying.

FREQUENCY RANGE

3.0 to 15.0 mc. in four channels. Each channel crystal controlled with common crystals for transmitting and receiving.
Channels 1 and 2 tune to any frequency between 3.0 and 7.5 mc.
Channels 3 and 4 tune to any frequency between 7.5 and 15.0 mc.

FREQUENCY STABILITY

$\pm 0.0002\%$ (2 cycles per megacycle).

ANTENNA REQUIREMENTS

10-80 ohms resistance with not less than 300 mmf. capacitance, for single-wire antenna for up to 4 channel use. Single-wire antennas of this type should not exceed $\frac{1}{4}$ wavelength at highest channel frequency used. A co-axial outlet is also provided for use with a 50-ohm unbalanced single channel antenna/feeder system or to connect a multichannel 50-ohm load (such as an antenna tuner).

POWER REQUIREMENTS

80 to 300 volts. 50/60 cycles, single phase. *(Caution:* Refer to INSTALLATION INSTRUCTIONS for proper adjustment.)

INPUT POWER LOAD

Receiver only: 85 watts.
No Signal, Power on: 270 watts (approx.).
With Single Tone input: 400 watts (approx.).
At Full Telephone output: 400 watts (approx.).

TRANSMITTER

POWER OUTPUT

100 watts PEP (peak envelope power), two-tone test.
100 watts CW, continuous duty, key down.
25 watts AM, continuous duty, either sideband with carrier.

MODES OF EMISSION

Phone: Single sideband suppressed carrier; Single sideband with carrier.
Choice of either upper or lower sideband.
Telegraph: A1; Single sideband keyed tone.
Audio Frequency Shift Teleprinter.

KEYING SPEED

60 words per minute manual operation (break-in); 60 words per minute teleprinter information.

AUDIO INPUT

Single-button carbon microphone from "local" handset, or from up to 3 remote positions.
-15 dbm in 600-ohm line for full output from transmitter.

SPEECH CLARIFIER

Range: ± 75 cps.

SPEECH CLIPPING

20 db.

DISTORTION

Transmitted sideband distortion: Single tone, full power output, no clipping, 2.5% at 1000 cps.
Two tone test: Distortion products, -30 db.

SPURIOUS OUTPUT

Unwanted sideband suppression: 50 db.
Carrier suppression: 50 db.
Harmonic suppression: 56 db.

RECEIVER

MODES OF RECEPTION

Single sideband suppressed carrier; single sideband with carrier; A1; A2; Single sideband keyed tone; A3; Audio Frequency Shift Teleprinter. Choice of upper or lower sideband reception by front panel control.

SENSITIVITY

Better than 1 microvolt for output with 15 db signal-to-noise ratio.

SELECTIVITY

3.2 kc. nominal bandwidth for 6 db attenuation.
6.5 kc. nominal bandwidth for 60 db attenuation.

IMAGE REJECTION

Ch. 1 & 2—70 db; Ch. 3 & 4—56 db.

AGC ACTION

± 1 db from 2 microvolts to 300,000 microvolts.

AUDIO OUTPUT IMPEDANCES

600 ohms and 3.5 ohms, independently controlled.

AUDIO OUTPUT

600 ohms, 100 mw.
3.5 ohms, 1 watt.

AUDIO DISTORTION

Less than 5% for half-power output on either 600 ohm or 3.5 ohm output.

MECHANICAL SPECIFICATIONS

DIMENSIONS

Cabinet: 21¾" x 22¾" x 15 3/16".
Minimum Space Required: 22" x 18".

CRYSTALS REQUIRED

*1—250 kc. RCA1041511-4
*1—1150 kc. RCA1041511-2
*1—1650 kc. RCA1041511-3
‡4—Type CR-27/U 4400 kc. to 16,400 kc. (one per channel).

Note: Channel crystals must be 1400 kc. higher in frequency than the desired operating frequency. The same crystals serve both the transmitter and the receiver.

* These crystals are supplied with the equipment.
‡ See Page 40 for details on ordering channel crystals.

TUBE COMPLEMENT

TRANSMITTER/RECEIVER

V201	RCA6146	Power Amplifier
V202	RCA6146	Power Amplifier
V203	RCA6146	Power Amplifier
V204	RCA6AL5	Modulation Indicator Rectifier
V205	RCA6CL6	Intermediate Power Amplifier
V206	RCA6CL6	Intermediate Power Amplifier
V207	RCA12AT7	3rd Balanced Modulator
V208	RCA12AT7	2nd Balanced Modulator
V209	RCA12AX7	1st Balanced Modulator
V210	RCA12AX7	Audio Amplifier—Receiver Muting
V211	RCA6CL6	4.4—16.4 mc. Crystal Oscillator
V212	RCA6BE6	1150-1650 kc. Crystal Oscillator
V213	RCA6BE6	250 kc. Crystal Oscillator
V214	RCA6BA6	R-F Amplifier
V215	RCA6BE6	1st Mixer
V216	RCA6BE6	2nd Mixer
V217	RCA12AX7	1st I-F Amplifier
V218	RCA6BA6	2nd I-F Amplifier
V219	RCA6BA6	3rd I-F Amplifier
V220	RCA6BA6	AGC Amplifier
V221	RCA6AL5	Demodulator
V222	RCA6AL5	AGC Diode—Squelch Diode
V223	RCA12AT7	Audio Amplifier—Squelch Triode

POWER SUPPLY

V101	RCA6U8	Preamplifier and Audio Amplifier
V102	RCA6AL5	Speech Clipper
V103	RCA12AT7	1 kc. Tone Oscillator
V104	RCAOD3/VR150	B-plus 150 V. Voltage Regulator
V105	RCAOA3/VR75	Bias Voltage Regulator
V106	RCA6AK6	Audio Output (600-ohm line)
V107	RCA6AK6	Audio Output (Spkr/Handset)

SEMICONDUCTOR DIODES

TRANSMITTER/RECEIVER

3 Germanium Diode, Type 1N34A
4 Silicon Diode, Type 1N2070

POWER SUPPLY

21 Silicon Diode, Type 40K
1 Silicon Diode, Type 1N2070

LAMPS

TRANSMITTER/RECEIVER

1—NE-51

POWER SUPPLY

7—NE-51

FUSES

POWER SUPPLY

1—5 Amp., time lag, 3AG
1—3 Amp., time lag, 3AG
1—1.0 Amp., time lag, 3AG
1—0.75 Amp., 3AG
1—0.5 Amp., 3AG
100% spare fuses packed with unit

TOOL COMPLEMENT

Alignment tool kit included, packed with unit

SHIPPING INFORMATION

Net Weight, 145.5 lbs.—65.997 kilos.
Legal Weight, 156.5 lbs.—70.987 kilos.
Gross Weight, carton packed, 185.0 lbs.—84.090 kilos.
Gross Cube, carton packed, 13.4 cu. ft.
Gross Weight, overpacked, 210.0 lbs.—95.454 kilos.
Gross Cube, overpacked, 15.5 cu. ft.

Note: Carton packing is standard waterproof tri-wall pack suitable for air and most export shipment. Overpack includes wooden case, if desired for under deck shipment.

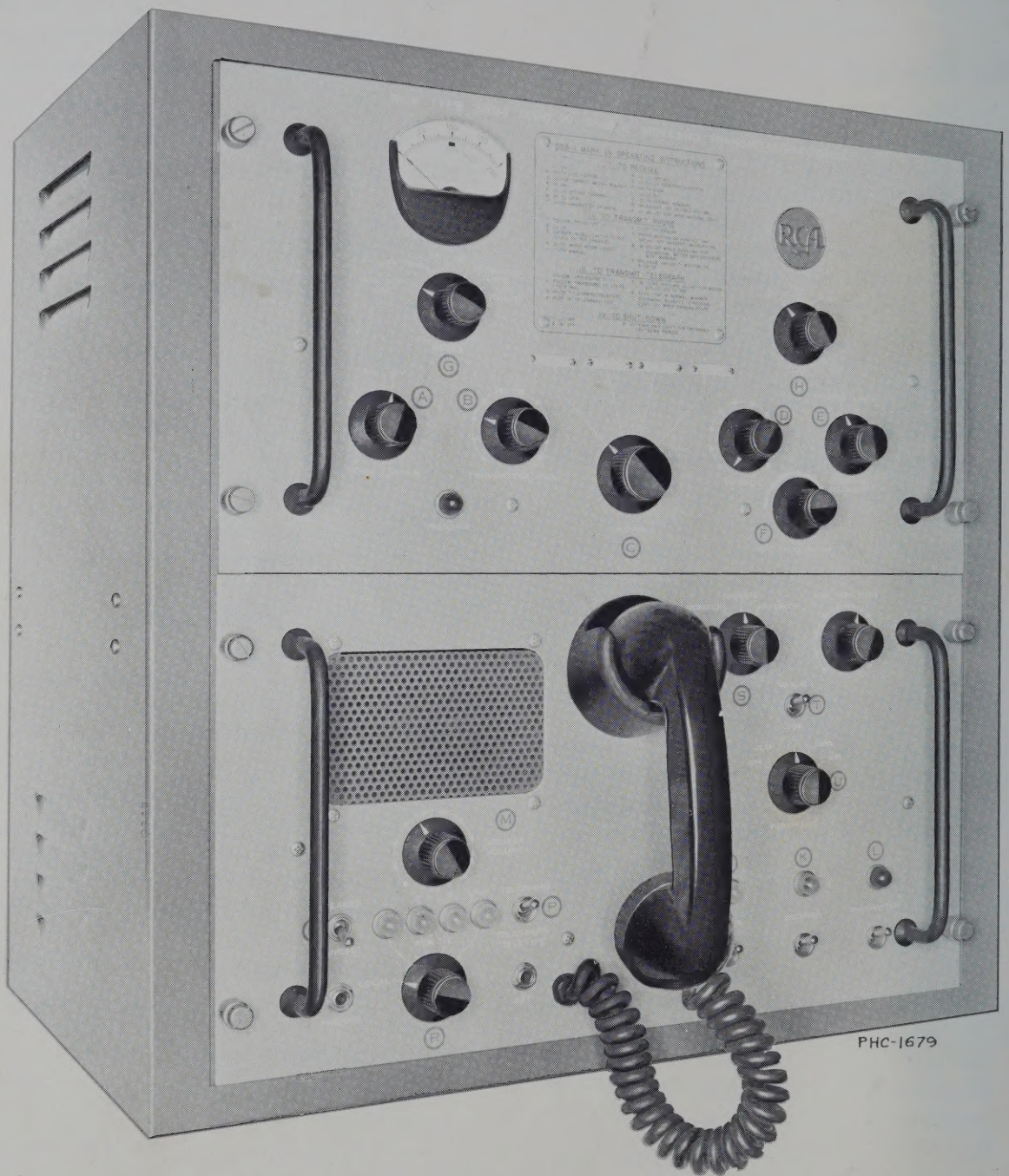


Fig. 1—RCA SSB-1 Mark IV, Selectable Single Sideband Communication Equipment, MI-22803

Section II

GENERAL INFORMATION

INTRODUCTION

The RCA Type SSB1-Mk. IV is a two-way radio communication equipment designed for operation on any one of four preselected frequencies between 3 and 15 megacycles.

The 100 watts peak envelope power output of the Mk. IV and its highly selective, sensitive receiver, meet the needs of communication services which require more than moderate power and yet retain simplicity of operation.

The flexibility of the SSB1-Mk. IV equipment permits its use in services such as simplex telephone systems; simplex telegraph or teleprinter systems; duplex telephone systems; duplex telegraph or teleprinter systems; and, compatible operation with conventional double sideband AM systems. Four preselected frequencies in the 3 to 15 megacycle range of the equipment, with optional upper or lower sideband operation at each frequency, provide a total of 8 usable channels.

Outstanding frequency stability ($\pm 0.0002\%$) is achieved by the use of 1° centigrade crystal ovens for the high frequency crystals, and source regulation of the plate voltage for the crystal-controlled frequency determining oscillator.

Ease of operation is assured by retaining all operating controls and indicators on the front panel of the unit. Each control is coded to correspond with an operating instruction chart, also mounted on the front panel. These charts are supplied in three languages (English, French and Spanish), with each unit. The simple, non-technical approach assures correct and efficient operation of the SSB1-Mk. IV by non-technical personnel.

Provisions are incorporated for operation of the Mk. IV from any one of three remote telephone-type desk sets. The unit may be keyed from any of these remote locations by push-to-talk, or voice keying if the unit is equipped with an optional voice operated keyer. In addition, full signaling and intercom facilities are incorporated to permit the local operator to call and talk to any of the remote sites without transmitting the conversation.

Other features include: a built-in speech clipper, providing 20 db of clipping; AGC in the receiver; a squelch circuit to permit noiseless stand-by operation; a noise limiter for suppression of extraneous impulse noise; and two separate audio outputs, one of which is terminated for direct connection to a standard 600-ohm line. Increased reliability and efficiency are assured by the use of silicon diode rectifiers in both the low voltage and high voltage power supplies.

The control circuits include: a sidetone monitoring circuit for phone and CW transmissions; provisions for selective ringing; remote channel indication or operation of accessory units; and a front panel meter for transmitter tuning, modulation indication and accurate line voltage adjustment.

The SSB1-Mk. IV is contained in a single cabinet $22\frac{3}{4}$ inches high, $21\frac{3}{4}$ inches wide and $15\frac{3}{16}$ inches deep. It consists of two units: the transmitter/receiver, constructed on a single chassis occupying the upper half of the cabinet; and a power supply unit, including audio and control circuits, which provides all operating and control voltages direct from the power mains, in the lower section of the cabinet.

With proper setting of transformer connections and the front panel adjustment, the equipment operates from any power source, 80 to 300 volts, 50 to 60 cycle single phase and requires approximately 400 watts input for full power output.

Accessory equipment available for use with the SSB1-Mk. IV includes a voice operated keyer, type VOK-10, remote telephone desk sets, an automatic antenna tuning unit, type AAT-100, and a linear power amplifier (including automatic antenna tuning), type SBA-1000, which provides up to 1 kilowatt peak envelope power output.

BASIC PRINCIPLES OF SINGLE SIDEBAND SUPPRESSED CARRIER COMMUNICATION

In a conventional amplitude-modulated transmitter the radiated signal includes a carrier, an upper sideband and a lower sideband. All of the intelligence is contained in the sidebands; none in the carrier. The carrier is transmitted primarily for use at the receiver for demodulation and automatic gain contol.

If a carrier of the proper frequency is generated at the receiver and inserted at the demodulator in the receiver, no carrier need be transmitted. Furthermore, since both sidebands contain the same information it is redundant and wasteful to transmit two identical channels when one alone is sufficient. Only one sideband need be transmitted to convey all of the useful information.

A conventional amplitude-modulated transmitter, modulated 100%, uses approximately 50% of the output power in the carrier and the remaining 50% of the output power divided equally between the two sidebands. Thus, since the usable information is in just one sideband, only 25% of the available power is used to convey the information. In addition, the spectrum space occupied is twice as much as is necessary.

For example: to transmit a 3 kc. audio signal with a sideband power of 100 watts would require a 6 kc. bandwidth and a 400-watt AM transmitter. Figure 2 compares the power output of a conventional AM transmitter rated at 100 watts, and the power output of a single

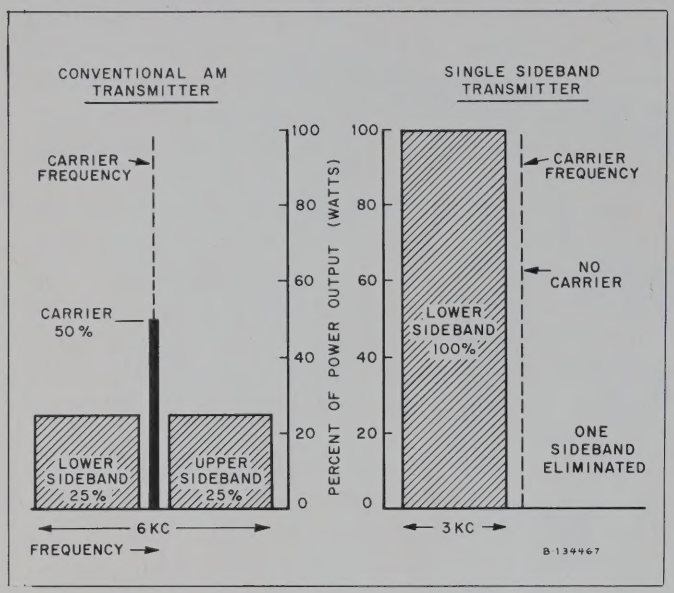


Fig. 2—Comparison of AM and SSB Relative Power Output

sideband suppressed carrier transmitter rated at 100 watts peak envelope power.

The RCA single sideband suppressed carrier transmitter eliminates the carrier and one sideband, thus requiring only one-half the spectrum space of the AM transmitter. To transmit a 3 kc. audio signal, only a 3 kc. bandwidth is required.

In receiving a single sideband suppressed carrier signal, since only half the AM signal bandwidth is required, noise is reduced by one-half (3 db.), and interference within the range of the eliminated sideband is also eliminated. The probability of random interference in the desired sideband is also reduced by one-half.

Since all the power is transmitted in one sideband, a power gain of 4 (6 db.) results for the wanted sideband. Including the 3 db. of noise elimination due to reducing the receiver bandwidth requirement by one-half, a system improvement in signal-to-noise ratio of 9 db. is realized. Thus, the SSB system compared with an AM system of the same rating as shown in figure 3 represents a power advantage of 8. In addition, speech clipping in the single sideband transmitter adds to the effective power gain. It can be stated then, that a single sideband suppressed carrier transmitter having a peak envelope power of 100 watts, is equivalent in effectiveness to an AM system using a transmitted power of 800 watts.

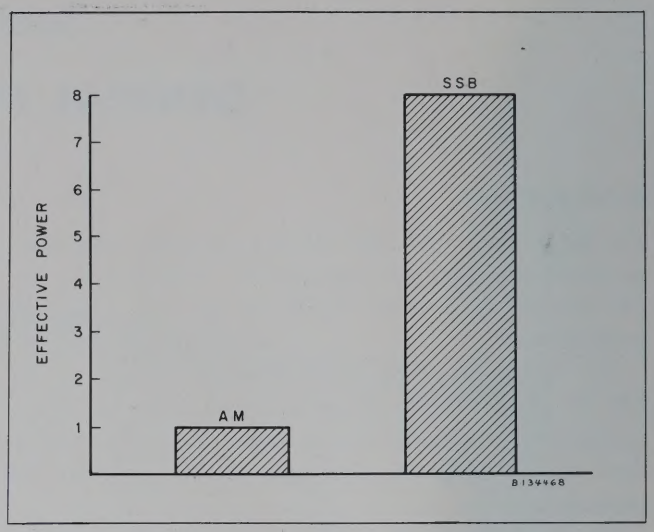


Fig. 3—AM vs. SSB System Effective Power Output

GENERATING A SINGLE SIDEBAND SIGNAL

A single sideband signal can be produced by introducing low-level audio and a low-frequency R-F signal into a balanced modulator circuit. However, when such a single sideband signal is generated at a low frequency, frequency multiplying circuits are not used to raise the signal to the desired transmission frequency because the original modulation would not be preserved. As a result heterodyning (the mixing of two or more frequencies to produce a third frequency), must be used to raise the low-level, low-frequency signal to the desired output frequency.

When a low frequency R-F carrier voltage (f_o) and an audio frequency voltage (f_a) are properly combined in a balanced modulator, as shown in figure 4, the output contains frequency components which include the sum of the two original frequencies ($f_o + f_a$) and the difference between the two original frequencies ($f_o - f_a$). The pure carrier (f_o) is cancelled and does not appear as such in the output circuit.

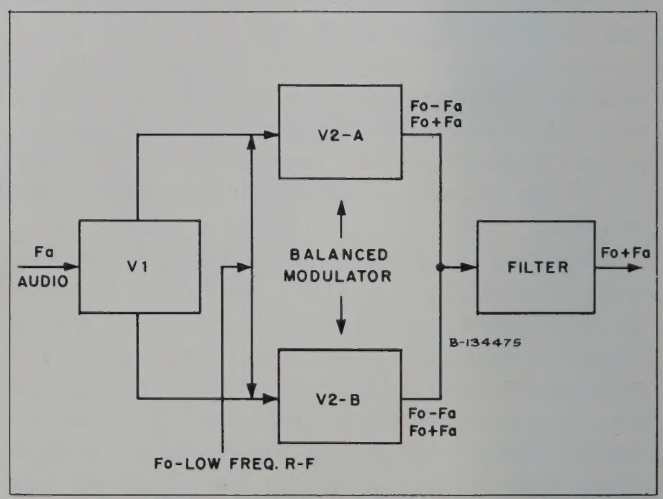


Fig. 4—Generating a Single Sideband Suppressed Carrier Signal

After mixing, either the sum (upper sideband, $f_o + f_a$) or the difference (lower sideband, $f_o - f_a$) component can be extracted from the composite signal by using suitable filters which pass the desired sideband and eliminate the other.

After this sideband selection, an additional series of balanced modulators and heterodyning oscillators repeat the above process until the signal has been heterodyned up to the output frequency desired.

ADVANTAGES OF SSB SUPPRESSED CARRIER COMMUNICATION

RCA single sideband suppressed carrier communication is superior to conventional amplitude-modulated communication in several respects:

(a) The radio-frequency spectrum is more efficiently utilized because a reduced carrier and a single sideband are transmitted in one-half the bandwidth required by the carrier and both sidebands of conventional AM equipment; the required bandwidth is even less when the carrier is completely suppressed and only a single sideband is transmitted.

(b) The power required to transmit a single sideband signal is only about one-eighth of the power required to transmit a conventional AM signal of equivalent system effectiveness. In addition, power is radiated only when modulation is present. This greatly decreases average power drain.

(c) The narrower bandwidths of SSB transmission and reception provide a 3 db improvement in signal-to-noise ratio and minimize the possibilities of interference. The effects of selective fading and phase distortion are also greatly reduced.

(d) Reception is improved by the reduction of steady heterodyne beats from adjacent stations. These heterodyne whistles are most prevalent on AM transmissions as a result of carrier interference.

(e) A greater degree of privacy is inherent with SSB since ordinary home-type short wave receivers capable of receiving conventional AM do not respond to SSB.

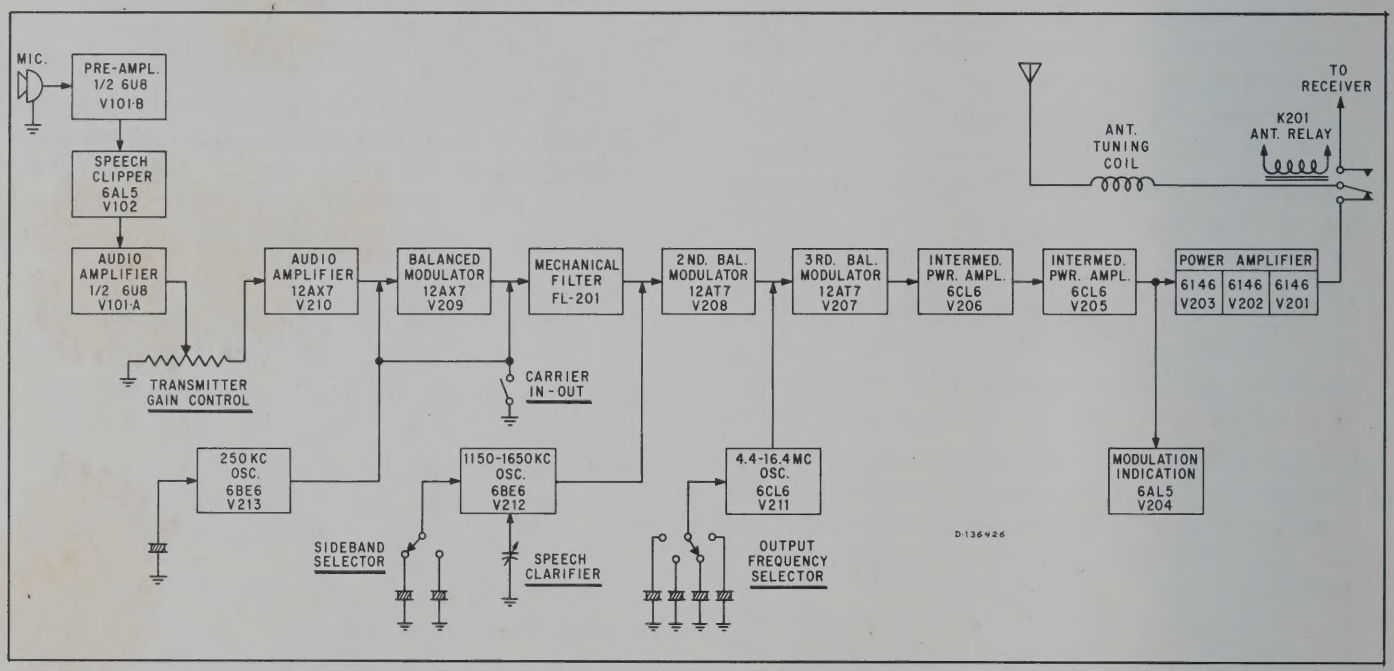


Fig. 5—Block Diagram, SSB-1 Mark IV, Transmitter Section

Section III

CIRCUIT DESCRIPTION

INTRODUCTION

The following descriptions explain each circuit function in the SSB1-Mk. IV. For a clear understanding of each function, the circuit discussion is divided into three sectons; the transmitter, the receiver, and the audio and control circuits.

In all these explanations it is assumed the nominal carrier or channel frequency is 10,000 kc and the intelligence to be transmitted and received is a 1 kc tone. The discussion is equally valid for a voice signal.

TRANSMITTER

The transmitter section of the SSB1-Mk. IV is shown in the block diagram, figure 5:

This diagram shows the relationship of the individual circuits and the signal paths from stage-to-stage.

Since the entire audio section of the unit is discussed as a separate section, only the transmitter audio stage, shown in figure 6, is discussed in this section.

AUDIO AMPLIFIER

Assume, in figure 6, that a 1000 cycle tone is applied to the grid of the 12AX7 audio amplifier (V210). R257, a 250K potentiometer, controls the input voltage to V210, which in turn controls the modulated output of the transmitter.

The output from V210 is composed of two 1 kc (1000 cycles) signals in phase opposition (180° out of phase, or "push-pull"). One output is taken from the plate circuit, and one from the cathode circuit.

Each of the outputs is applied to a grid of the first balanced modulator, (V209), type 12AX7.

BALANCED MODULATOR

At the same time the push-pull 1 kc signals are fed to the grids of V209, a single 250 kc low-frequency carrier signal, from a crystal-controlled oscillator (6BE6, V213), is applied in-phase (or parallel) to each grid of V209 through resistors R248 and R249.

NOTE: When a balanced modulator circuit is properly adjusted, the carrier signal (applied to the grids in parallel) is cancelled and the sum and difference frequencies of the carrier and the two input signals (applied in push-pull) are included in the output.

To obtain balanced output, a 20,000-ohm potentiometer, R242, is connected through R241 and R243, between both plates of V209. The movable arm of R242 is connected to the regulated B-plus 150-volt supply through R235. Adjustment of R242 controls the B-plus voltage appearing at each of the plates of the tube. Together with capacitor C256, the balance control (R242) effects maximum cancellation of the unwanted 250 kc carrier.

The output of V209 includes two signals; one at 251 kc (the sum of 250 kc and 1 kc), the other at 249 kc (the difference between 250 kc and 1 kc).

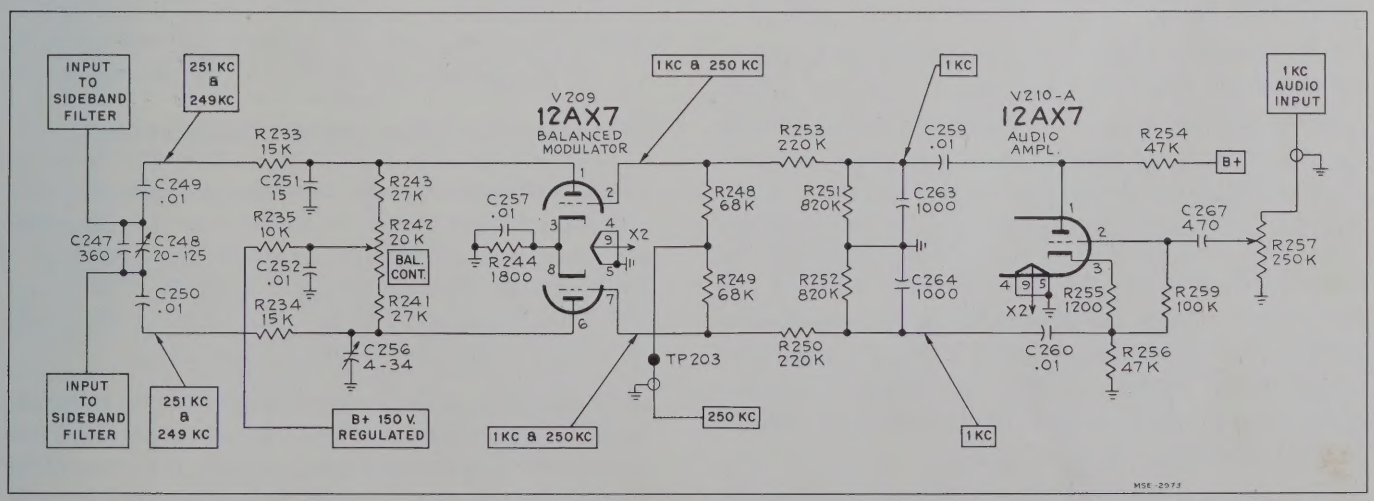


Fig. 6—Schematic Diagram—Audio Input and 1st Balanced Modulator

250 KC OSCILLATOR

The 250 kc oscillator (V213) uses a type 6BE6 in a crystal-controlled oscillator circuit shown in figure 7. Tuning of this circuit is accomplished by C346, a small variable capacitor between grid #1 of the 6BE6, and ground. The plate voltage of V213 is supplied in parallel with the plate of V219 (a 6BA6, the 3rd I-F Amplifier in the receiver).

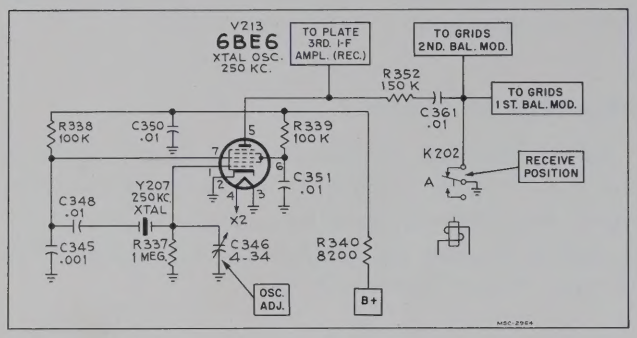


Fig. 7—Schematic Diagram—250 Kc Oscillator

As previously indicated, output from the 250 kc oscillator is applied in-phase to each grid of V209, the 1st balanced modulator. In addition, a portion of the 250 kc oscillator signal is used for insertion at the 2nd balanced modulator input when it is desirable to transmit a single sideband with carrier. (The transmitter output then contains a reinserted carrier and can be received by a conventional AM receiver.) The "A" contacts of relay K202 close when the Mk. IV is in the RECEIVE position, and shunt to ground the 250 kc signal at the grids of the 1st and 2nd balanced modulators. Heterodyning in the transmitter cannot then occur because of the absence of the 250 kc oscillator signal at the balanced modulator grids. This insures that the transmitter will be inoperative during periods of reception.

MECHANICAL FILTER

The 251 kc and 249 kc signals present at the output of V209 are introduced into filter FL201, an electromechanical filter designed to pass a band of frequencies in the 250 kc range with excellent rejection of frequencies outside of the desired pass-band. The filter contains a special nickel-alloy rod resonant in the 250 kc range. Accurately processed ferrite rods, and electrical coils, are attached to both ends of the resonator to couple and transform electrical energy into mechanical energy. The entire assembly, shown in figure 8, weighs only seven ounces and is housed in a metal case filled with an inert gas and hermetically sealed. No adjustments are required in the filter unit.

The materials used for the metal resonator and ferrite rods are carefully selected and processed to produce filter

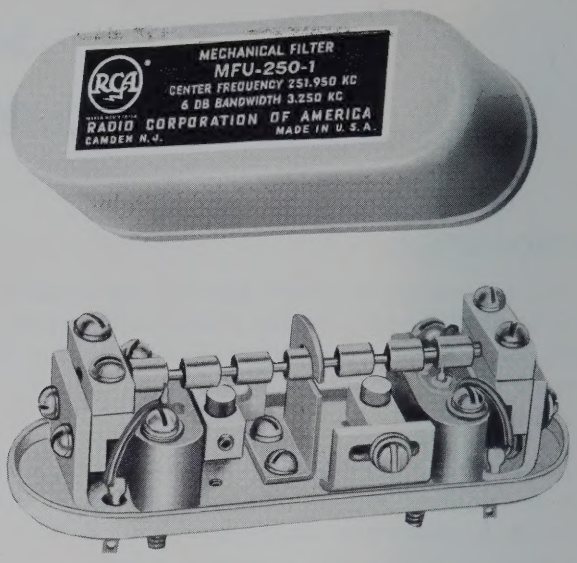


Fig. 8—RCA Type MFU-250-1 Mechanical Filter Unit

elements that will have little frequency variation with temperature change. To achieve the excellent bandpass characteristics of this filter, such resonators and couplers require exacting workmanship. The degree of selectivity of the filter is dependent proportionately upon the number of tuned elements of the resonator, while the width of the passband is a design function of the mechanical couplers between the tuned elements.

The response of the RCA type MFU-250-1 filter used in this equipment is shown in figure 9.

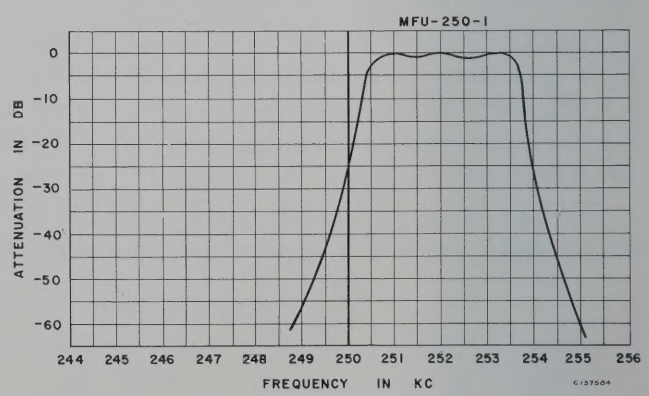


Fig. 9—Response of FL201 Mechanical Filter

It can be seen from the chart that all frequencies outside the passband of the 250 kc filter are rejected, while the frequencies inside this passband are limited to a bandwidth of approximately 3.25 kc at the 6 db points. The filter rejects the 249 kc lower sideband and passes only the 251 kc upper sideband information.

At this point in the transmitter (the output terminals of FL201) the single sideband signal is present for the first time. The succeeding stages of the transmitter heterodyne this signal to the desired output frequency and amplify it to the desired power level.

2nd BALANCED MODULATOR

The purpose of the 2nd balanced modulator is to heterodyne the single-sideband signal to a higher frequency.

The 251 kc signal present at the output of the mechanical filter (FL201) is applied, through transformer T202, in phase opposition (180° out of phase) to each grid of the 12AT7 (V208) 2nd balanced modulator. See figure 10. To provide the required heterodyning action in this circuit, for upper sideband operation, a 1650 kc oscillator signal is applied equally to the grids of the 2nd balanced modulator. This is done in a manner similar to that used in applying the 250 kc signal to the 1st balanced modulator. Also, as in the 1st balanced modulator, a balance control, R224, and a capacitor, C239, are adjusted to cancel the carrier; the carrier in this instance being 1650 kc.

TRANSMISSION WITH CARRIER

So that compatible operation of the SSB-1 Mk. IV with AM receivers can be maintained, switch S202, provides a means for "reinserting" or adding a carrier to the single sideband signal. Regulation of the reinserted carrier level is provided by C243, a small variable capacitor which is *not* an operating control. C243 is adjusted at the factory for proper carrier level insertion.

CAUTION

DO NOT ATTEMPT TO READJUST C243 UNLESS PROPER TEST AND MEASURING EQUIPMENT IS AVAILABLE.

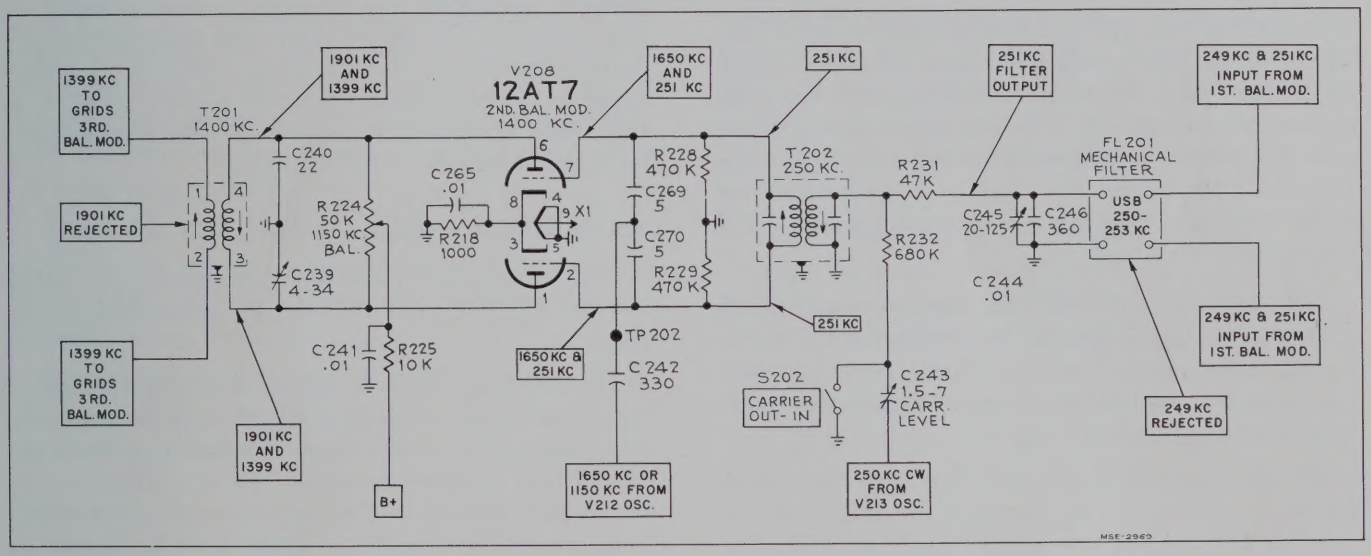


Fig. 10—Schematic Diagram, 2nd Balanced Modulator

The output of the 2nd balanced modulator includes both the sum and the difference frequencies of the 1650 kc signal and the 251 kc single-sideband signal.

In the output circuit a double-tuned transformer, T201, is tuned to 1400 kc, which means that frequencies outside a narrow range in the vicinity of 1400 kc will be rejected.

When operating UPPER sideband, the sum frequency of 251 kc and 1650 kc is 1901 kc, and the difference frequency is 1399 kc. Since T201 will pass frequencies only near 1400 kc, the 1901 kc sum signal is rejected and only the 1399 kc signal is passed to the next circuit, the 3rd balanced modulator. The above discussion is equally valid for lower sideband operation using an 1150 rather than a 1650 kc crystal. In this case T201 will accept only the sum signal and reject the difference signal.

Placing S202 in the IN position injects the 250 kc oscillator signal into the 2nd balanced modulator together with the 251 kc single sideband signal passed through the sideband filter.

Under these conditions, the signal at the output of the 2nd balanced modulator contains the 1901 kc and 1399 kc sideband as described above, and also the carrier, 1400 kc, the difference signal between 1650 kc and 250 kc.

Both the 1399 kc single sideband signal and the 1400 kc carrier signal are present, and remain at the same frequency relationship, i.e., 1 kc apart. When heterodyned to the final output frequency, the carrier (which was at 1400 kc.) appears at 10,000 kc and the single-sideband signal (which was at 1399 kc.) 1 kc higher, appears at 10,001 kc.

1150-1650 KC OSCILLATOR

The oscillator, supplying the 1150 and 1650 kc signals (for upper or lower sideband selection) to the 2nd balanced modulator, is a crystal-controlled Pierce circuit using a type 6BE6 tube (V212).

The two crystals, one for the 1150 kc LOWER SIDEBAND signal, and one for the 1650 kc UPPER SIDEBAND signal, are mounted in a plug in combination crystal oven/holder unit E203. This oven is thermostatically controlled to maintain crystal temperature constant at 75°C plus or minus 1 degree centigrade. Accurate temperature control assures excellent frequency stability for both the transmitter and the receiver. 6.3V AC for crystal oven E203 heating is supplied by transformer T107 in the power supply unit.

Two small variable capacitors are used for tuning the crystals exactly to frequency. C343 tunes the 1150 kc crystal and C344 tunes the 1650 kc crystal.

The SPEECH CLARIFIER Control, another small variable capacitor, C341, is adjustable as an operating control on the front panel of the transmitter/receiver unit. The purpose of this capacitor is to vary the frequency of the crystal in use over a total vernier range of approximately 150 cycles per second (±75 cps.) to compensate for slight differences between the received frequency and the transmitted frequency.

If a received or transmitted signal is slightly "off frequency" it is possible for the sideband filter in the receiver to attenuate a portion of the speech or audio frequency to the extent that a garbled or distorted signal would appear at the audio output.

The speech clarifier, as its name implies, clears up this condition by very slightly changing the transmitted or received frequency to bring the speech or audio frequency components within the sideband filter passband limits.

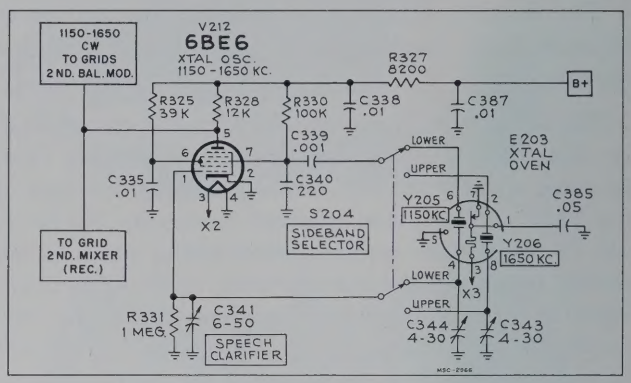


Fig. 11—Schematic Diagram 1150-1650 kc Oscillator

Output from V212 is taken from the plate circuit and is fed through a capacitor C242 to the grids of the 2nd balanced modulator. The 1150 kc or 1650 kc signal is also applied to the grid of the second mixer (V216) of the receiver section through C334. Selection of either upper or lower sideband operation is made by S204, a front panel operating control, which switches the applicable crystal into the oscillator circuit.

3rd BALANCED MODULATOR

The 3rd balanced modulator heterodynes the signal (which is at this point 1399 kc) up to the final output frequency.

The 1399 kc signal developed in the 2nd balanced modulator is fed, as shown in figure 12, in phase opposition (180° out of phase) to each of the two grids of the 12AT7 3rd balanced modulator (V207, pins 2 & 7). By the same process used in the previous balanced modulator circuits, an oscillator signal 1400 kc higher in frequency than the desired output carrier frequency is applied in-phase to the two grids of V207. In this

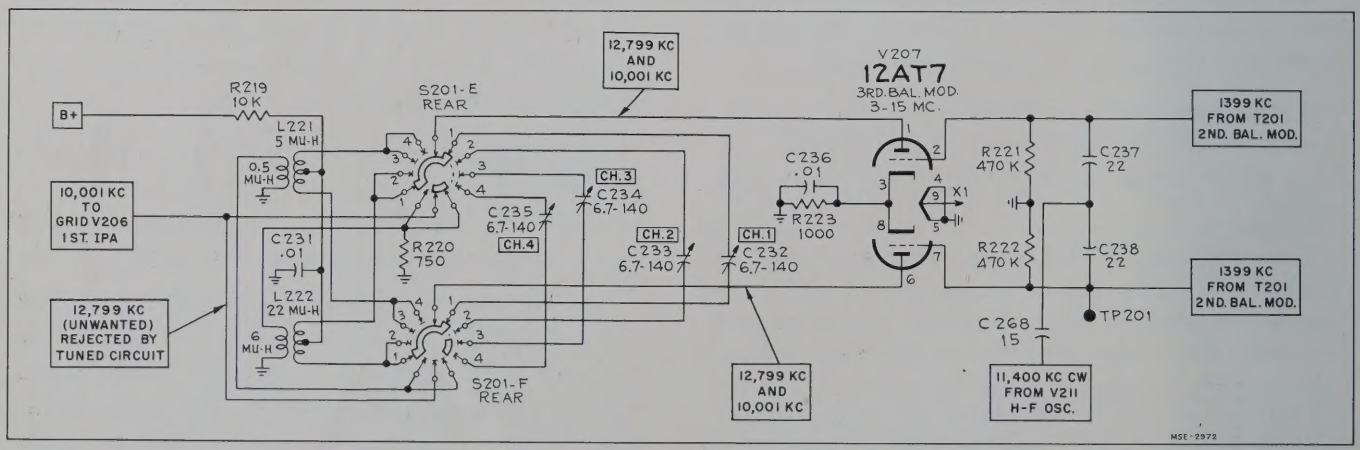


Fig. 12—Schematic Diagram—3rd Balanced Modulator

example, since a 10,001 kc signal is desired at the output (10,000 kc carrier frequency), the oscillator signal must be 11,400 kc.

The output at the plates of V207, the 3rd balanced modulator, is 11,400 kc plus 1399 kc, or 12,799 kc, and 11,400 kc minus 1399 kc, or 10,001 kc. The latter, 10,001 kc, is the desired output frequency. Pre-tuned inductances and capacitances (L221, L222 and C233, C234, C235, C236) in the 3rd balanced modulator output circuit are selected by sections S201E and S201F of the CHANNEL switch. When this switch is in the proper position (channel 3 or 4 rather than channel 1 shown in the schematic diagram) the tuned circuits pass the 10,001 kc upper sideband signal and reject the 12,799 kc signal. As in the previous balanced modulators, the 11,400 kc oscillator signal is cancelled.

H-F R-F OSCILLATOR

The H-F R-F oscillator circuit supplies the 3rd balanced modulator with the oscillator signal necessary to heterodyne the single sideband signal from the 2nd balanced modulator to the desired output frequency. This oscillator also supplies the heterodyne signal to the 1st mixer stage in the receiver.

The circuit uses a type 6CL6 power pentode (V211) and any one of four crystals, Y201 to Y204. Each of these crystals is 1400 kc higher in frequency than the desired channel frequency.

Crystals are selected by section S201G of the CHANNEL switch. As with the 1150-1650 kc crystals, the R-F oscillator crystals are mounted in plug-in combination oven/holder units, E201 and E202. These ovens are thermostatically controlled to maintain crystal oven temperature constant at 75°C plus or minus 1 degree. This accurate temperature control assures excellent stability for both the transmitter and the receiver. In addition, plate voltage for V211 is source regulated to further insure precise frequency stability.

Two 1N34 crystal diodes, CR202 and CR203, maintain the output voltage of the oscillator at a constant amplitude over its entire frequency range.

INTERMEDIATE POWER AMPLIFIERS

The intermediate power amplifier stages amplify the single sideband output signal developed by the 3rd balanced modulator to the level required to drive the Power Amplifier stage.

Continuing with the example (a 1 kc audio signal heterodyned to 10,001 kc) the 10,001 kc signal developed in the 3rd balanced modulator is fed to the input grid of the 6CL6 (V206). This is an untuned buffer stage. Output from this circuit, at 10,001 kc, is next applied to the input grid of V205. This is a conventional class A power amplifier circuit which uses a 6CL6 power pentode.

After amplification the 10,001 kc signal is fed through the pretuned output circuit to the grids of the 6146 Power Amplifiers V201, V202, V203. Section S201D of the CHANNEL switch selects any of the four frequencies pretuned by L212, L213, L214, L215 and C220. (In this example, the switch would be set at channel 3 or 4, to pass the 10,001 kc signal and either L212 or L213 would be used in conjunction with C220.)

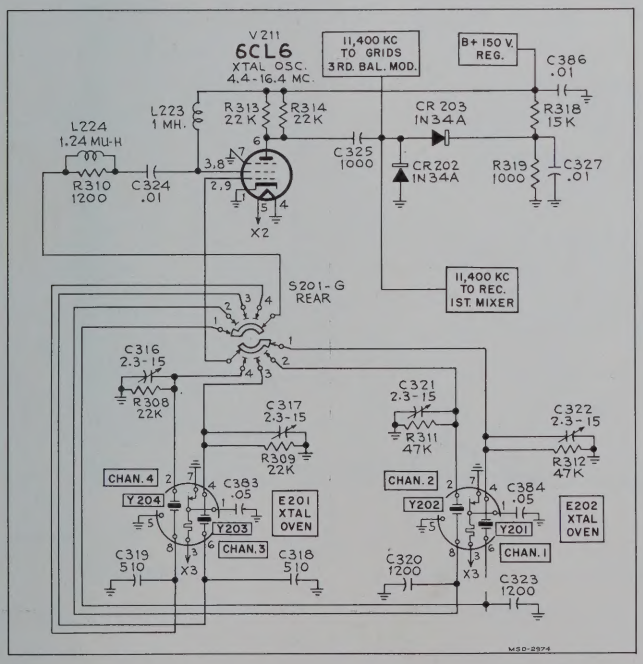


Fig. 13—Schematic Diagram H-F R-F Oscillator

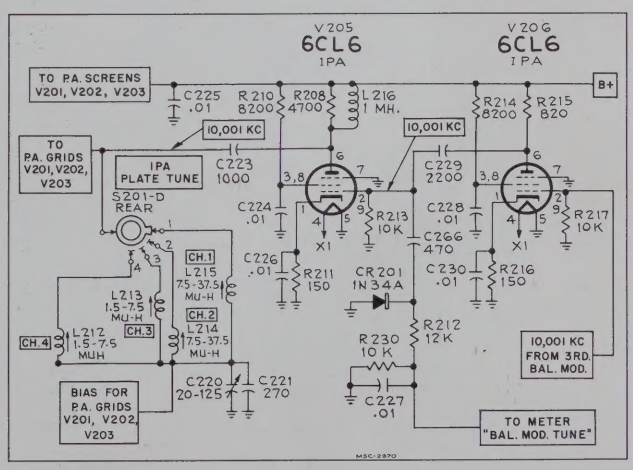


Fig. 14—Schematic Diagram—Intermediate Power Amplifier

CR201, a 1N34 germanium diode, rectifies a portion of the output from V206. This rectified signal is applied through the meter switch to the front panel meter to provide indication of 3rd balanced modulator tuning.

Screen voltage for the P.A. tubes is supplied from the same source that supplies the plates of both I.P.A. tubes.

POWER AMPLIFIER

The power amplifier stage amplifies the single sideband signal to full R-F output. It then feeds the high power signal through tuned circuits to the antenna.

Figure 15 shows the schematic diagram for the Power Amplifier circuit.

The 10,001 kc signal at the output of the Intermediate Power Amplifier V205, is applied to the grids of the Power Amplifier tubes. This stage consists of three type 6146 tetrodes connected in parallel for class AB_1 linear operation.

The common plate circuit of the paralleled power amplifiers is tuned to the desired output frequency by capacitors C205 for channel 4, C206 for channel 3, C207 for channel 2 and C208 for channel 1. Tapped coil L201 forms the inductive part of the output circuit for all four channels. Switch section S201C of the CHANNEL switch selects the proper capacitor to be used. Switch section S201B selects the proper tap on L202.

The amplified 10,001 kc signal (the signal in this illustration) is coupled to the antenna through the tapped loading coil L201. This coil is tuned by capacitors C201 for channel 1, C202 for channel 2, C203 for channel 3, and C204 for channel 4. Switch section S201 of the CHANNEL switch selects the power capacitor and the correct tap on the loading coil. This is accomplished at the same time that other channel switching functions take place.

R-F Power output is applied to the antenna through the contacts of K201, the antenna changeover relay. R-F is then present at terminal E204, a ceramic standoff insulator and, at J201, a coaxial connector. The coaxial connector, J201, is suitable for use with a standard 50 ohm transmission line or an external antenna tuner such as the RCA Type AAT-100 Automatic Antenna Tuner. Terminal E204 is intended for use with conventional single-wire antennas.

K201, the antenna changeover relay, in conjunction with the transmit/receive relay operates to automatically switch the antenna to transmitter output or receiver input.

METER CIRCUITS

The SSB-1 Mark IV features a front panel meter which permits monitoring of Power Amplifier plate current, Intermediate Power Amplifier tuning, Balanced Modulator tuning, Modulation level and AC power line input voltage.

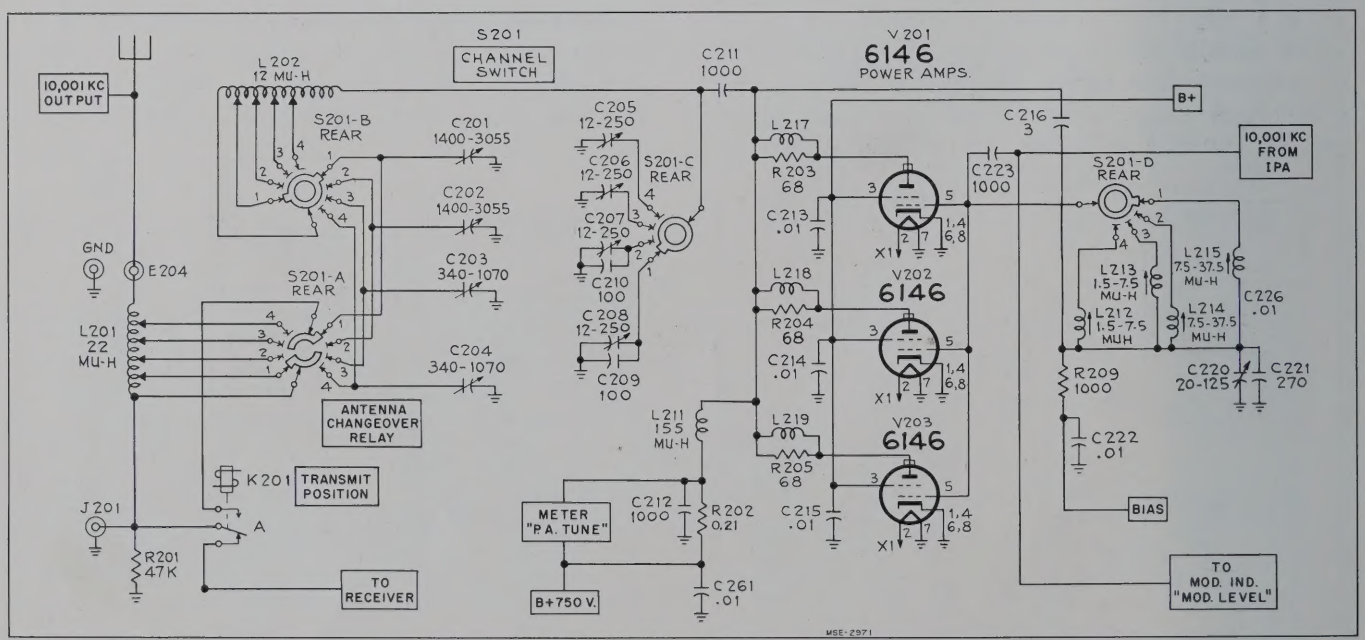


Fig. 15—Schematic Diagram—Power Amplifier

Each of these conditions may be checked by turning the meter switch knob to the function desired. The meter switch, S203, is a 5 position two section rotary switch mounted on the front panel of the transmitter receiver unit.

As indicated in figure 16, Switch position #1 connects the meter, M201, between the input grid of the intermediate power amplifier, V205, and ground. As mentioned, CR201 rectifies a small portion of the output of V206. This is fed through M201 to provide indication of the output of the 3rd Balanced modulator.

Switch positions #2 and #4 connect the meter between R207, at the cathode of V204, the 6AL5 modulation indication rectifier, and ground. V204 rectifies a portion of the signal appearing at the grids of the Power Amplifier. In position #2 the rectified signal provides indication for tuning the Intermediate Power Amplifier V205. At position #4, the same signal is used to check modulation level.

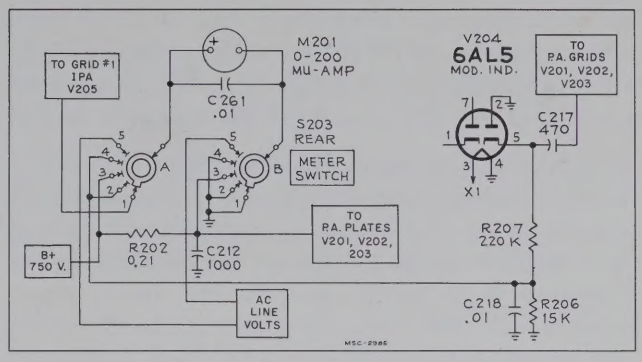
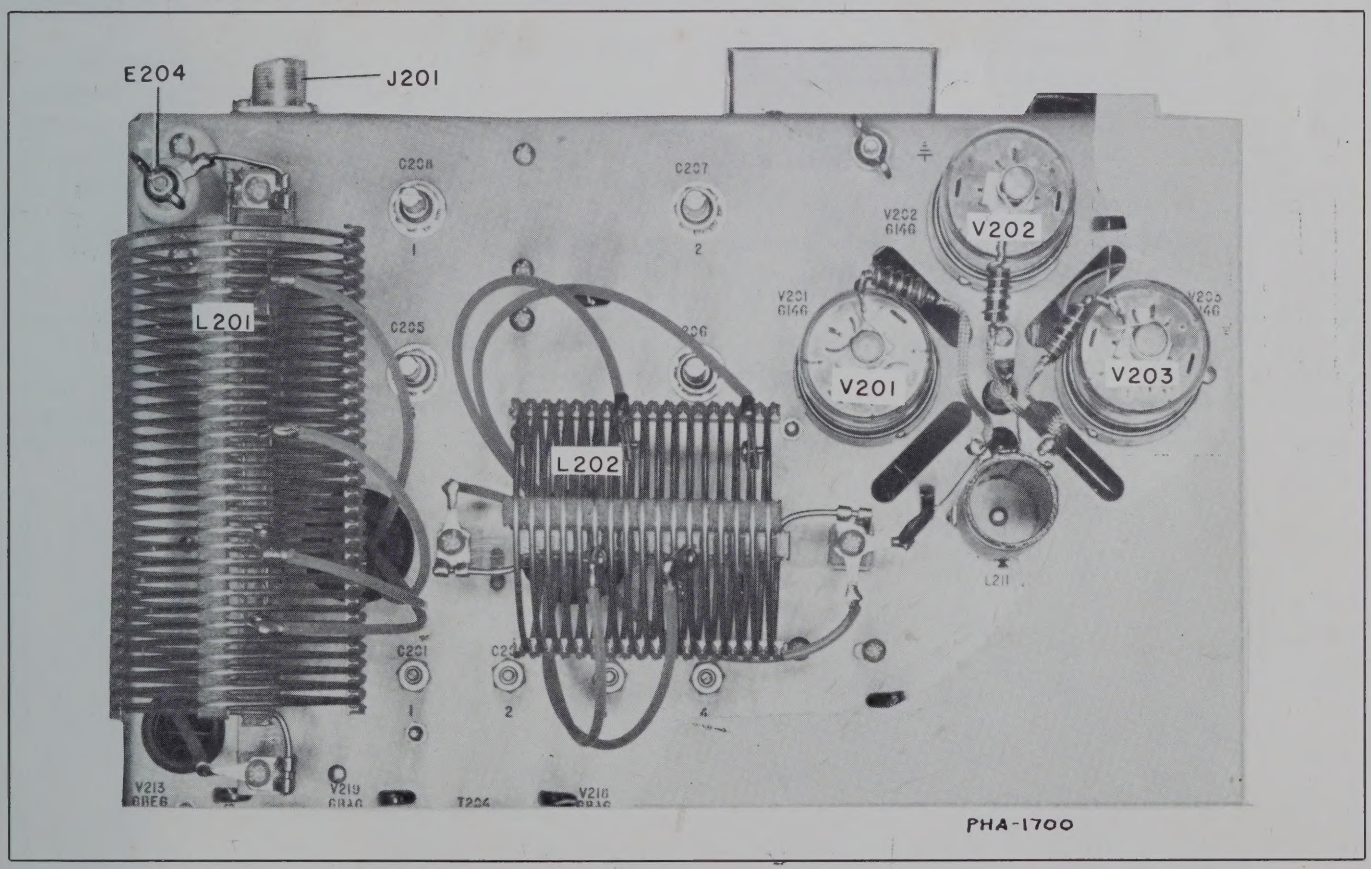


Fig. 16—Schematic Diagram—Metering Circuits

Switch position #5 connects the meter across terminals #16 and #17 on TB101 in the power supply unit. CR107, a 1N2070 silicon diode in the AC power line rectifies the line voltage to obtain line voltage indication on the meter.

Note: In the LINE VOLTAGE position, M201 reads *relative voltage.* The meter is *not* calibrated directly in volts.



Components in the Power Amplifier Stage

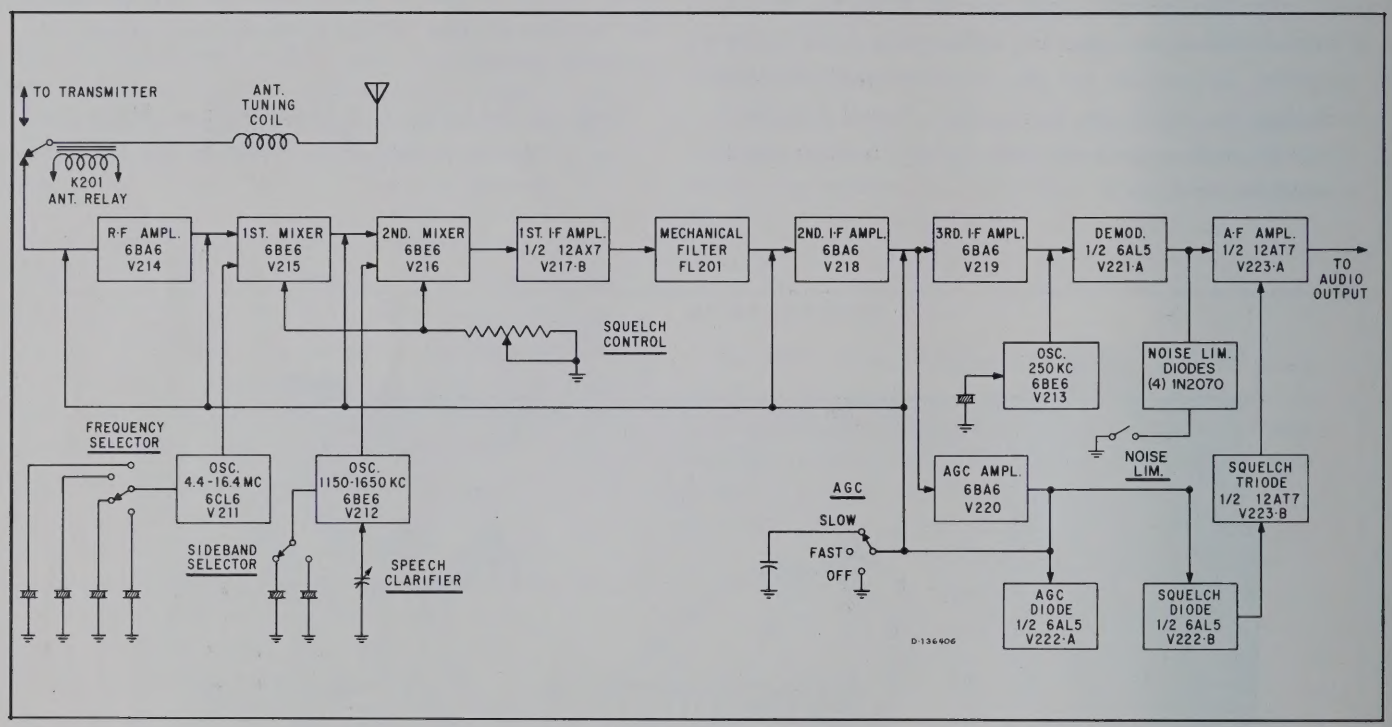


Fig. 17—Block Diagram, SSB-1 Mark IV, Receiver Section

RECEIVER

Single sideband suppressed carrier reception requires techniques somewhat different from conventional AM methods.

One of the foremost considerations is that of extreme selectivity since only one sideband at any given carrier frequency is processed to extract the transmitted intelligence.

In developing a single sideband suppressed carrier signal for transmission, the original modulating frequency must be raised to the desired output frequency by the process of heterodyning. (Frequency multiplying circuits are not used because they would destroy the original modulation.)

In heterodyning, signal mixing in a properly designed circuit produces the desired modulation by the sum and difference method. If two signals are introduced into such a mixing circuit, the output of the circuit contains both the sum of and the difference between the two signals. As an example: If a 100 kc signal and a 1000 kc signal were introduced into a mixer circuit, the output would include signals at 900 kc (the *difference* between 1000 kc and 100 kc) and 1100 kc (the *sum* of 1000 kc and 100 kc).

If the output of this mixer circuit is fed through sharp bandpass filters, constructed with the proper circuit constants, either the sum or the difference signal can be selected or rejected. This is possible because these tuned circuits are normally sensitive to only a restricted range of frequencies. Using these filters in the low frequency circuits rather than at the high frequencies is more practical because at higher frequencies circuit components become extremely critical and comparatively unstable. It is therefore more difficult to obtain sharp selectivity at high frequencies. Conversely, at the lower frequencies (below 300 kc) it becomes practical to employ extremely sharp filters. In fact, the sideband filter used in the Mk. IV (designed to center on 250 kc) has a bandpass characteristic which accepts signals over a range of only 3.25 kc and rejects any signals outside this 3.25 kc passband.

Since the single sideband suppressed carrier signal is developed by heterodyning the signal upward to the frequency of transmission, in the receiver, this process must be reversed and the received signal heterodyned *downwards*. When heterodyning "down" it is necessary to process the difference signals rather than the sum signals in order to obtain the original modulating frequencies.

Essentially then, the Mk. IV receiver heterodynes the received signals *down* to 250 kc where a mechanically resonant tuned circuit, (the bandpass filter) processes the resultant signal to remove all but the desired sideband.

In the following sections, each circuit of the Mk. IV receiver is explained in detail, proceeding logically through the R-F Amplifier; the mixers and heterodyning oscillators, through to the audio output and external control functions. Figure 17 shows a block diagram which should be used as a reference for these simplified explanations of the receiver.

The following discussions assume that the nominal received suppressed carrier or channel frequency is 10,000 kc and the intelligence is a 1 kc tone. The discussion is equally valid for a voice signal.

R-F AMPLIFIER

The R-F amplifier of the SSB-1 Mk. IV receiver uses a 6BA6 tube (V214) in a conventional pentode amplifier circuit. Separate ferrite-tuned coils in the grid and plate circuits are used for each channel to achieve good selectivity and sensitivity for best superheterodyne operation. Grid coils L203 and L204 may be adjusted to any frequency in the 3 to 7.5 megacycle range; coils L205 and

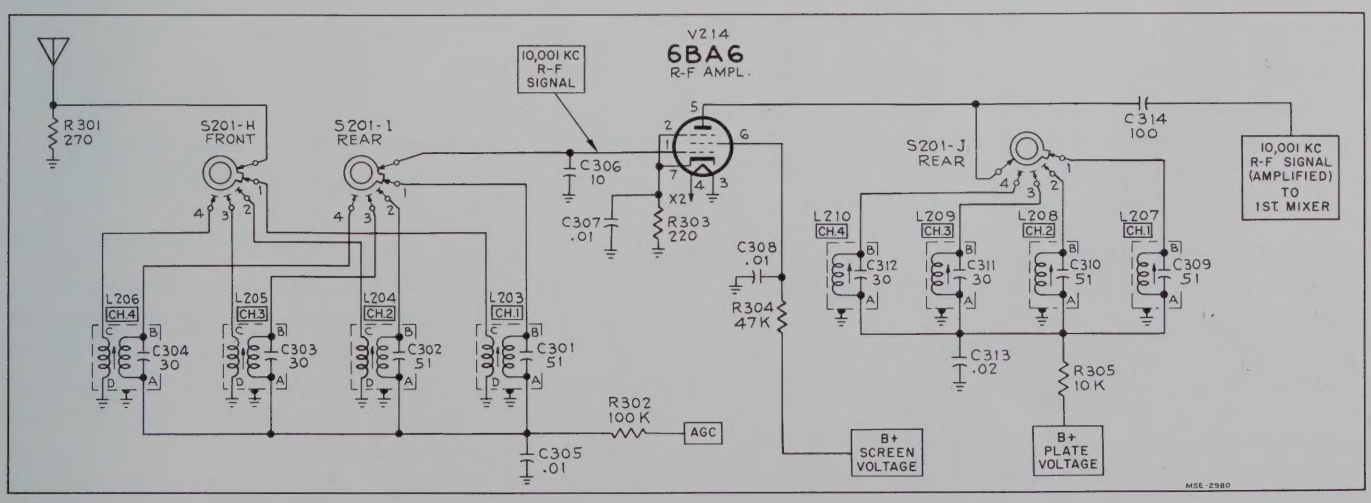


Fig. 18—Schematic Diagram—R-F Amplifier

L206 to any frequency in the 7.5 to 15 megacycle range. The R-F plate circuit coils, L207 to L210 inclusive, tune to the same frequencies as the corresponding grid coils. L207 and L208 tune to any frequency between 3 and 7.5 mc and L209 and L210 to any frequency in the 7.5 to 15 mc range. For convenience in tuning, all plate and grid coil adjustments are accessible from the top of the chassis. These adjustments are made by turning the threaded brass screws at the top of each coil shield can. All plate and grid coils are enclosed in metal shield cans to prevent interaction with other circuits.

The CHANNEL knob on the front panel controls a four-position, eleven-section ceramic wafer switch (S101-A to S101K) to select one of four available channels. The appropriate antenna coils for each channel are switched into the grid circuit of the R-F amplifier V214 by S201H (front), and S201I (rear). S201J (rear), switches the appropriate tuning coil for each channel to the plate of V214.

H-F OSCILLATOR

The H-F oscillator is a four-channel, crystal-controlled oscillator of the Pierce type. The channel crystals are connected between the screen grid and control grid of the 6CL6 tube (V211). The output from this circuit is electron-coupled to the plate. V211 supplies the mixing frequency for the transmitter 3rd balanced modulator and the receiver 1st mixer stages. Crystals for this oscillator are mounted in dual plug-in crystal ovens (E201, E202). Each oven has a temperature-controlled heating element connected to 6.3 volts AC supplied by transformer T107.

To produce a conversion frequency of 1400 kc the H-F oscillator crystals are cut 1400 kc higher in frequency than the frequency of the channel to be received. As an example; if the desired channel frequency is 10,000 kc, the crystal required will be 10,000 kc plus 1400 kc, or 11,400 kc.

Any one of four crystals (Y201, Y202, Y203, Y204) may be selected by CHANNEL switch (S201G). The output voltage of the crystal oscillator is kept at a constant amplitude over the entire frequency range by diodes CR201 and CR202.

A regulated source of plate voltage for the oscillator aids in maintaining frequency stability.

FIRST MIXER

The output of the H-F oscillator is coupled to grid #1 of the 6BE6 1st Mixer tube (V215) by capacitor C326. The received signal from the R-F amplifier is applied to grid #3. The received signal is thus heterodyned with the oscillator signal to produce an intermediate frequency of 1400 kilocycles. The insertion of the oscillator signal at the control grid instead of grid number three, amplifies the oscillator signal to the level required for good conversion of single sideband signals. A test point, TP204, is connected to grid number three of the 6BE6 mixer tube (V215) to provide a means of injecting an R-F or I-F test signal for alignment purposes. TP204 is conveniently located on top of the chassis. A double-tuned I-F transformer (T203) tuned to 1400 kc (the difference frequency in the conversion process) couples the output of the 1st mixer to the 2nd mixer.

A variable resistor, R317, is connected in the cathode circuit of the first and second mixer stages to vary the gain of the R-F section of the receiver. This resistor functions as a squelch control for the receiver since the squelch bias on the A-F amplifier tube, V223A, depends on the level of the I-F signal. (See circuit description of the Squelch amplifier and diode.)

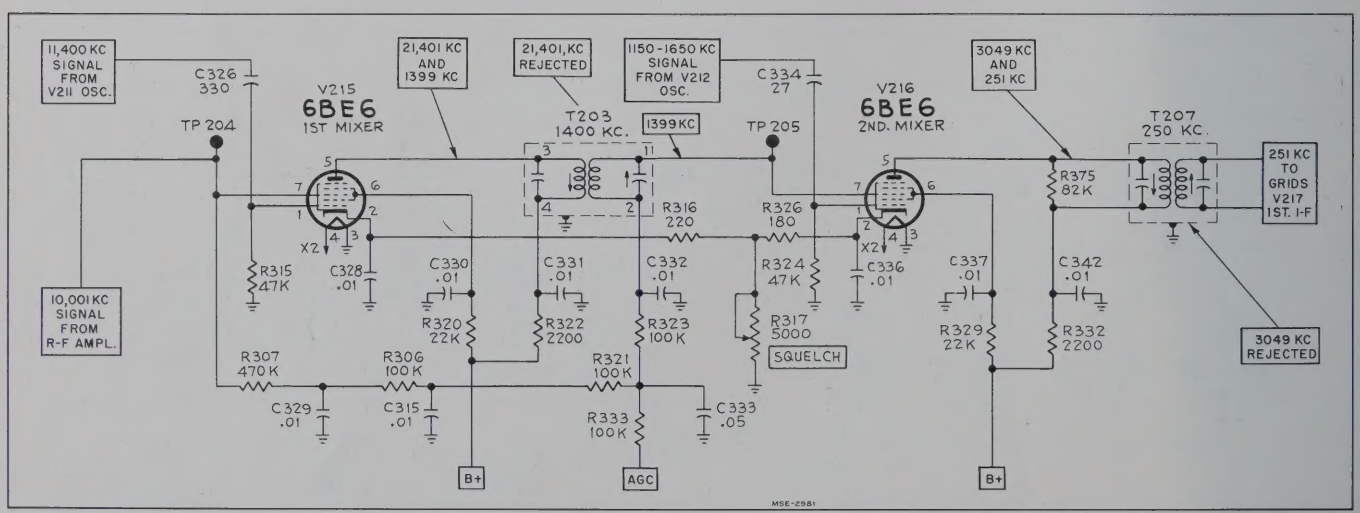


Fig. 19—Schematic Diagram—1st & 2nd Mixers

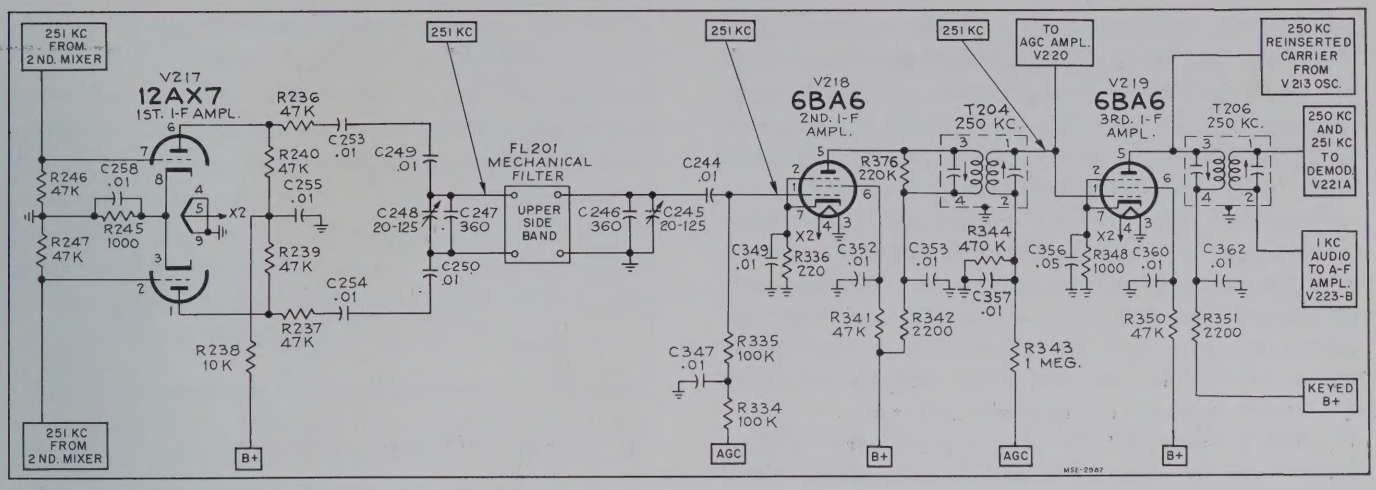


Fig. 20—Schematic Diagram—1st, 2nd, 3rd I-F Amplifier

1150-1650 KC OSCILLATOR

The 6BE6 crystal oscillator (V212) uses either of two crystals (Y205, Y206); one at 1150 kc for reception of lower sideband signals, and one at 1650 kc for upper sideband reception. Either crystal is selected by the SIDEBAND SELECTOR switch, S204. Both crystals are contained in oven E203 which is similar to the high-frequency R-F oscillator ovens. Current for this oven is also supplied by transformer T107 in the power supply.

The purpose of this oscillator (V212) is to generate a signal to heterodyne with the 1400 kc I-F signal to produce a second intermediate frequency of 250 kc. The reason for two crystal frequencies is explained in the section on Upper and Lower Sideband reception.

SECOND MIXER

The output of the dual-frequency oscillator (1150 kc or 1650 kc) is applied to grid number one of the 6BE6 second mixer tube (V216). The 1400 kc I-F signal obtained from the 1st Mixer is applied to grid #3 of V216. The difference frequency of 250 kc (1650 minus 1400 or 1400 minus 1150) is selected in the conversion process and is coupled to the low I-F amplifier by interstage transformer T207.

Another test point, TP205, is provided for alignment or test purposes at grid #3 of the 2nd Mixer tube.

FIRST I-F AMPLIFIER

The secondary winding of the 250 kc I-F transformer T207 connects to the grid of each section of a dual triode 12AX7 (V217). The output of this balanced I-F amplifier is coupled to the mechanical filter FL201. A balanced circuit for the I-F amplifier is required in the receiver, because the mechanical filter is also connected to a balanced circuit in the transmitter. However, the output of the filter is unbalanced and is coupled to a conventional single ended pentode (V107) 2nd I-F amplifier circuit.

UPPER AND LOWER SIDEBAND RECEPTION

If upper sideband reception of a 1 kc tone modulation is desired from a channel frequency of 10,000 kc (actual transmitted signal 10,000 kc + 1 kc or 10,001 kc) the sideband selector, must be set in the UPPER position. This switches in the 1650 kc crystal and applies a 1650 kc signal to the #1, or control grid of the second mixer (V216). The signal at grid #3 (pin #7, V216) is 1399 kc. The 1st mixer output is tuned to pass signals only in the vicinity of 1400 kc. The 21,401 kc sum signal of 11,400 kc and 10,001 kc is rejected and only the 1399 kc difference signal of 11,400 kc and 10,001 kc is passed to the grid of the second mixer.

The output of the 2nd mixer will include the sum of 1650 kc and 1399 kc (3049 kc) and the difference between 1650 kc and 1399 kc (251 kc). The 251 kc signal at the output of the 2nd mixer will be accepted by the 1st I-F amplifier, and the 3049 kc signal will be rejected. Thus, in the second conversion, at 250 kc, the original upper sideband modulation has produced *only* an *upper* sideband signal at the input to the low intermediate frequency amplifiers in the receiver.

Conversely, if the lower sideband were used, with the same channel frequency and 1 kc tone modulation (i.e., a transmitted frequency of 10,000 kc minus 1 kc, or 9999 kc), the 1150 kc crystal is selected by S204 when this switch is placed in the LOWER position.

Under these conditions the output from the 1st mixer includes the R-F oscillator crystal frequency of 11,400 kc plus the 9999 kc signal, 21,399 kc which is rejected, and the difference between 11,400 kc and 9999 kc, (1401 kc) which is applied to the #3 grid of the 2nd mixer.

Output from the 2nd mixer will then include 1401 kc plus 1150 kc (2551 kc which is rejected) and the difference between 1401 kc and 1150 kc or, 251 kc, which will be passed by the 250 kc I-F transformer T207.

Reception of either an upper or lower sideband signal will result *only* in an *upper* sideband signal at 250 kc and only one bandpass filter, designed to pass this upper sideband, need be used. The table, shown below, shows in simplified form the conversion of a received (desired) signal to the 250 kc intermediate frequency range.

The SPEECH CLARIFIER control, which is a small variable capacitor (C341), eliminates distortion of voice reception occurring when a signal is received slightly off the channel frequency. C341 is connected to the ground (earth) side of crystals Y205 and Y206. A small variation in capacity between the crystal and ground varies the crystal frequency by approximately plus or minus 75 cycles per second. This control is necessary to compensate for equipments, without speech clarifiers, which do not have good frequency stability.

ELECTRO-MECHANICAL FILTER

A single mechanical filter, FL201 is used for both the transmitter and receiver. A common filter for both the receiver and transmitter is possible because of the special design of the 1st I-F amplifier V217. The filter function is the same in both transmitter and receiver, i.e., to eliminate all frequencies except those falling within the desired passband, 250 to 353 kc (refer to page 12 for detailed information about the filter unit).

SECOND AND THIRD I-F AMPLIFIERS

The output of the mechanical filter is a band of frequencies in the 250 kc range which contains the modulation of one of the transmitted sidebands. The excellent selectivity of the receiver is obtained by this filter; and the excellent gain of the receiver is due mainly to the three stages of amplification at the low intermediate frequency of 250 kc. Pentode amplifier tubes, (V218, V219—6BA6) are used in the second and third amplifier stages with double-tuned I-F transformers (T204, T206) used for coupling.

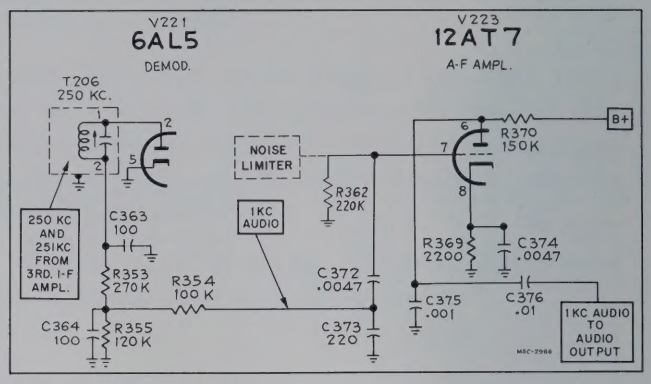


Fig. 21—Schematic Diagram—Demodulator & 1st AF Amplifier

DEMODULATOR

Single sideband suppressed carrier communication has the carrier suppressed, or eliminated. For demodulation (detection) a carrier must be injected locally. In the Mk. IV receiver a crystal oscillator supplies the proper carrier for demodulation purposes. The primary of I-F trans-

FREQUENCY TO BE RECEIVED 10,000 kc. - 1 kc. modulation	
LOWER SIDEBAND RECEPTION	**UPPER SIDEBAND RECEPTION**
10,000 kc. to 9999 kc.	**10,000 kc. to 10,001 kc.**
1st CONVERSION	1st CONVERSION
R-F Osc. crystal frequency ..... 11,400 kc.	R-F Osc. crystal frequency ..... 11,400 kc.
Desired frequency ..... 9999 kc.	Desired frequency ..... 10,001 kc.
1st Mixer Output ..... 1401 kc.	1st Mixer Output ..... 1399 kc.
2nd CONVERSION	2nd CONVERSION
1st Mixer Output ..... 1401 kc.	V212 Output ..... 1650 kc.
V212 Output ..... 1150 kc.	1st Mixer Output ..... 1399 kc.
2nd Mixer Output ..... 251 kc.	2nd Mixer Output ..... 251 kc.
RANGE OF UPPER SIDEBAND FILTER 250-253 kc.	RANGE OF UPPER SIDEBAND FILTER 250-253 kc.
I-F AMPLIFICATION 250 to 253 kc.	I-F AMPLIFICATION 250 to 253 kc.

former T206 is a plate load impedance for two tubes—the 3rd I-F amplifier tube (V219) and also the 250 kc crystal oscillator tube (V213). By using a plate load impedance common to both output circuits, the oscillator carrier and the I-F signal are easily combined and a high ratio of carrier level to signal level is maintained. The secondary of transformer T206 couples the combined signals to the plate of a 6AL5 diode (V221A). This tube rectifies (demodulates) the signal, and the information contained in the sideband appears across the diode load resistor R355 as the desired audio signal.

Any R-F remaining in the output signal is bypassed by capacitors C363, C364 and C373. Capacitor C372 then couples the audio signals obtained from the demodulator to the grid of a 12AT7 (V223), audio amplifier tube.

250 KC OSCILLATOR

As described in the previous section, the signal for carrier reinsertion is generated by the 250 kc crystal oscillator. A 6BE6 (V213) pentagrid converter tube is used for this purpose in a Pierce oscillator circuit. Grid number three of this 6BE6 acts as a plate for the oscillator. The actual plate of the 6BE6, is electron-coupled to grid three. This technique couples the oscillator signal to the demodulator circuit without loading the oscillator. With such a circuit arrangement, tuning adjustments of the I-F transformer T206 will have little effect on the oscillator frequency.

AUDIO AMPLIFIER AND OUTPUT

The received audio signals are amplified by a 12AT7 triode audio amplifier tube (V223A) and two 6AK6 output tubes. The two output tubes are located on the power supply chassis. The audio signal from V223A is coupled to the output tubes via shielded cables connected to terminals 9 and 10 of TB101. One of the audio output tubes, V107, drives a 4" x 6" PM speaker mounted on the front panel of the receiver. The other output tube, V106, supplies audio voltage for 600-ohm line output. A terminal board (TB104) on the rear of the power supply chassis provides connections for a 600-ohm line at terminals 3, 4 and 5.

Separate gain controls, control each audio output independently. The LINE LEVEL CONTROL (located inside the unit on the power supply chassis) controls the audio level into the 600-ohm line; VOLUME, controls the audio output from LS101 and headphones. A jack (J103) on the front panel is provided for connection of headphones.

SQUELCH CIRCUIT

The purpose of a squelch circuit is to silence the receiver when there is no information being received. This allows the operator to have the receiver volume control turned "up", ready to receive transmissions, without hearing annoying background noise. A circuit schematic diagram of the squelch circuit appears in figure 22.

Operation of this circuit is as follows: When the squelch section of the 12AT7 (V223B) is conducting

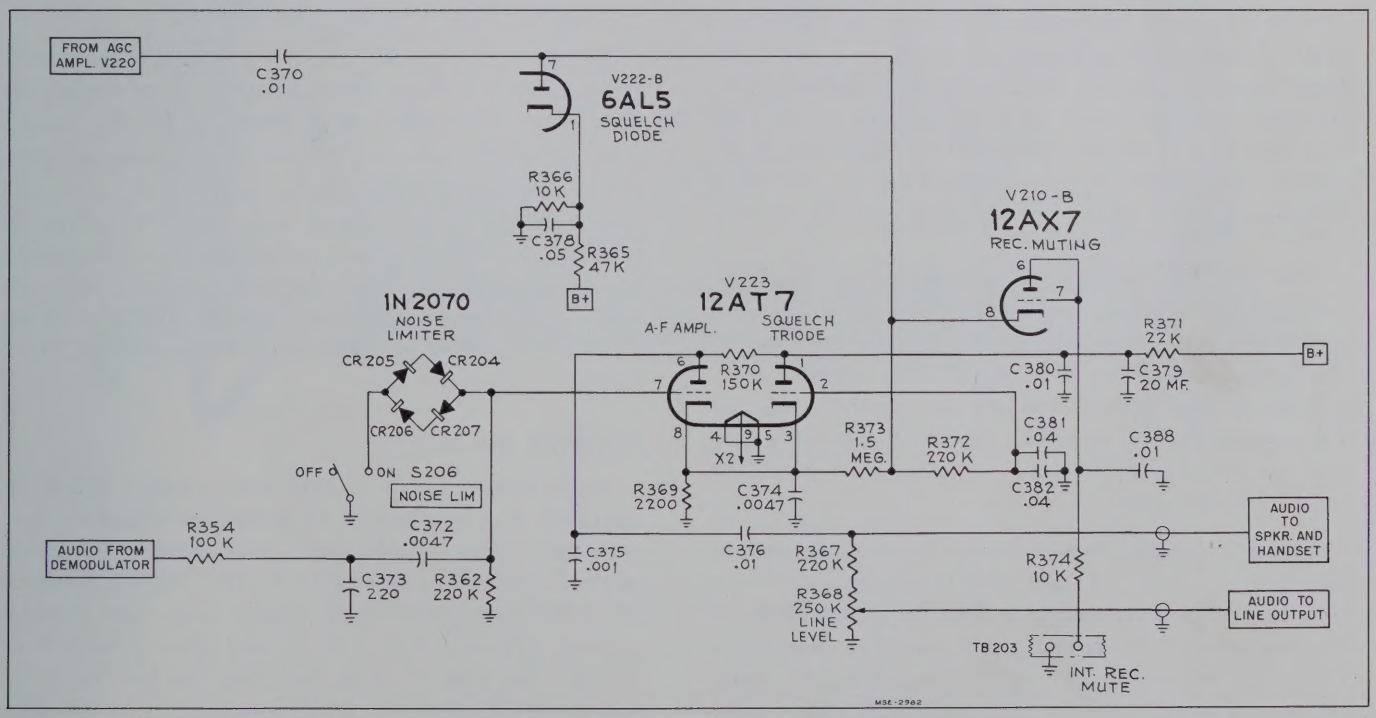


Fig. 22—Schematic Diagram—Squelch, Noise Limiter and Rec. Muting

heavily, the A-F amplifier section of this tube (V223A) is "cut off" (squelched) and there is no audio output. This action results since the cathode resistor of V223 (R369) is common to both the squelch section and A-F amplifier sections. When the voltage on this cathode becomes sufficiently high, the bias on the A-F amplifier tube will increase, preventing amplification of audio signals.

NOISE LIMITER

Noise occurs in the presence of high-amplitude short-duration pulses from unshielded ignition systems, atmospheric static or other impulse-type radiation.

The action of the noise limiter is to shunt these high-amplitude short-duration pulses to ground thus removing them from the audio input and providing quieter, more intelligible reception during operation under high-noise conditions.

The noise limiter circuit is shown in figure 22. Four 1N2070 silicon diodes are connected in a bridge circuit to the grid of the 1st audio amplifier, one triode section of V223. Switch S206, when in the "on" position, places the diode bridge network between the grid of the tube and ground, in shunt with R362. When the noise limiter is in the circuit, any audio voltage at the grid of the tube, above the level determined by the conduction of the four diodes across R362, will be shunted to ground.

AGC AMPLIFIER AND DIODE

The AGC amplifier tube 6BA6 (V220), amplifies the 250 kc I-F signal appearing at the grid of V219. This stage of amplification is necessary to obtain a sufficiently high voltage level at the AGC diode V222A. In addition the AGC amplifier output feeds the Squelch diode. T205 is a 250 kc I-F transformer with its primary and secondary coils connected in parallel. This transformer is the plate load impedance for the AGC amplifier tube.

The AGC diode (V222A) is coupled to the AGC amplifier by capacitor C371. This diode rectifies the I-F signal and produces a negative voltage proportional to the strength of the received signal. The negative AGC voltage is then filtered and applied simultaneously to the grids of the R-F amplifier, 1st and 2nd mixer stages, and the 2nd I-F and 3rd I-F amplifiers to control the overall receiver gain.

The AGC switch, located on the front panel, permits selection of either of two time constants—FAST or SLOW. SLOW AGC action is used for single sideband reception and FAST action for AM reception. Since there is no carrier present on single sideband signals, there will not be a signal present constantly at the plate of the AGC diode. However, a 2 mf. capacitor C365, (which is slow to discharge) is used on SLOW AGC and thus

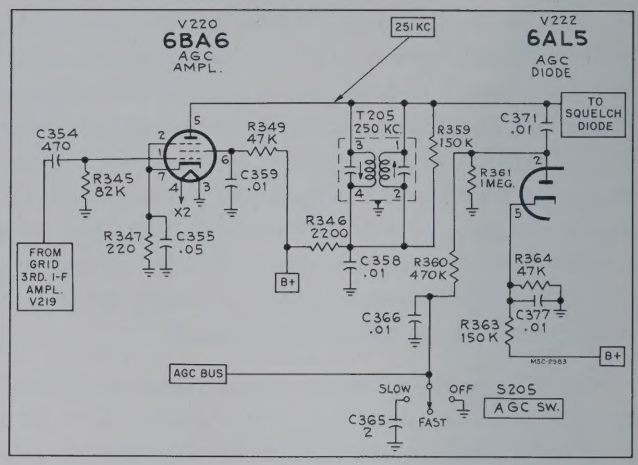


Fig. 23—Schematic Diagram—AGC Amplifier and Diode

maintains the bias level between modulation intervals. When S205 is switched to OFF, the AGC voltage is shorted to ground and the R-F and I-F stages will have maximum gain, limited only by the position of the squelch control.

An external source of AGC voltage may be connected to rear of the receiver, at terminal board TB203, if control of this function is desired from another point.

When a signal is received, the squelch diode conducts and develops a negative voltage at its plate. This negative voltage, applied to the grid of the squelch triode, effectively reduces the current through R369. This reduces the cathode voltage on V223 and substantially reduces the negative bias on the A-F amplifier section. This allows the tube to amplify audio signals.

A squelch control, R317, is located on the receiver front panel. It controls the squelch circuit by varying the gain of the two mixer stages. When the squelch control is set at MAX., the receiver will have *maximum* gain. Under these conditions, noise pulses can cause the squelch diode to generate enough negative voltage to remove the squelch on the audio amplifier and permit the noise to be audible. For best operation, turn the squelch control toward MIN. (during a period of no reception) until the background noise cannot be heard and the receiver is quiet.

RECEIVER MUTING

Audio muting of the receiver may be desirable, during operation of a transmitter, to prevent reception of your own transmitted signals. This can be done at the transmitter location by shorting INT. REC. MUTE terminal of TB203 and ground by a suitable relay during transmission periods. This will ground pins 6 and 7 of V210B. The tube conducts removing the bias from the squelch triode section of V223 causing it to conduct. Conduction of the squelch triode causes the AF amplifier to be squelched.

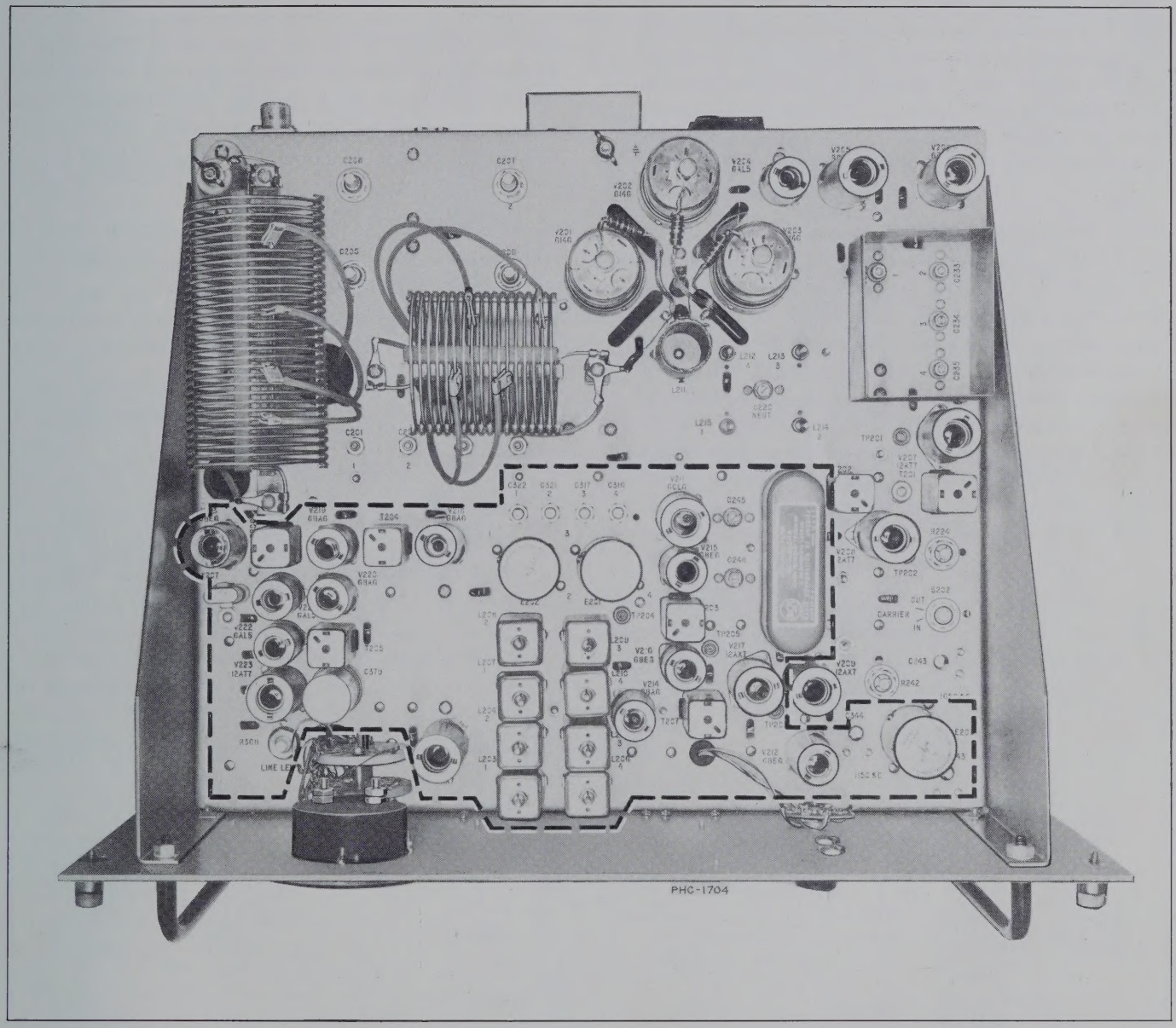


Fig. 24—Top View, Transmitter/Receiver Chassis, showing receiver section

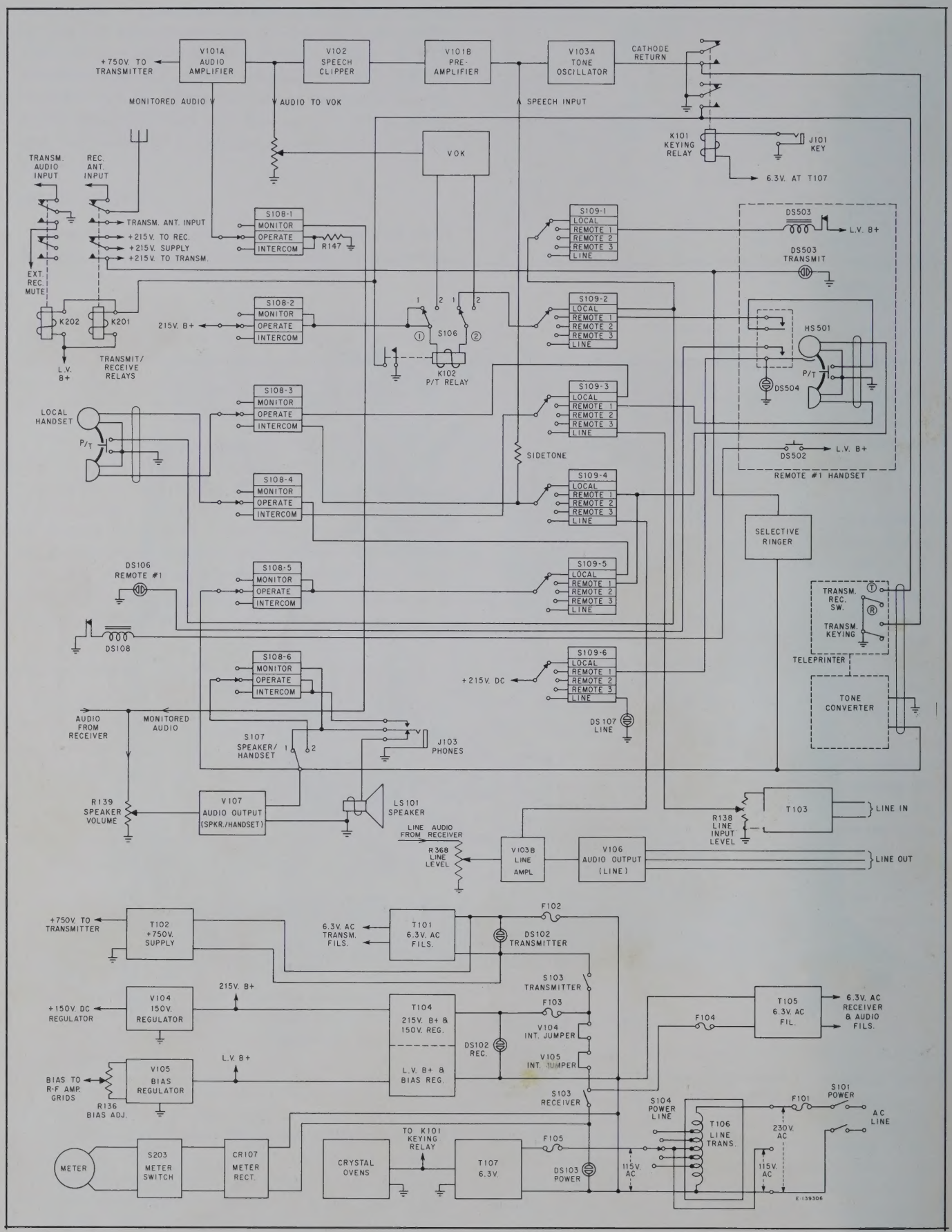


Fig. 25—Block Diagram, SSB-1 Mark IV, Power, Audio and Control Circuits

POWER UNIT

The Block diagram, figure 25, shows the power unit of the SSB1 Mark IV. All power supplies, control circuits, transmitter audio input circuits and receiver audio output circuits are contained in this unit.

This illustration presents a simplified diagram showing the inter-relationships of the individual power and control sections and their functions.

POWER INPUT AND LOW VOLTAGE SUPPLIES

Any single phase, supply source between 80 and 300 volts AC, 50 to 60 cycles, may be used for operation of the SSB-1 Mark IV equipment. A tapped auto-transformer T106, whose output is selected by the power line switch S104, permits this wide range of voltage input to be used.

When shipped, each SSB-1 Mk. IV equipment has its AC input connected for the highest source range. This is done at the factory. It avoids possible fuse failure, or transformer damage should a maximum of 300 volts AC be applied prior to adjustment.

The entire equipment is fused by F101 — a 5 ampere 3 AG fuse located in the AC input line.

CAUTION:

REFER TO THE INSTALLATION INSTRUCTIONS IN SECTION IV PAGE 37 BEFORE APPLYING POWER TO THE EQUIPMENT.

Switch S101 in the AC input line controls the power to all sections.

The AC voltage present at the output of T106 is rectified by CR107. The resultant DC voltage is then fed to the meter switch located on the transmitter/receiver front panel. With the meter switch in the LINE VOLTAGE position, a reading will be indicated on the meter. Switch S104 should be turned to the position that causes the meter indication to fall within the black area marked "LINE."

NOTE:—The proper adjustment of POWER LINE switch S104 is covered under INSTALLATION INSTRUCTIONS on page 37. As outlined, the AC source voltage should be a nominal value of 115 V AC or 230 V AC. The power input connections on TB102 are determined by the value of this source voltage. Figure 26 shows connections for a nominal 230 V source with connections made to terminals 1 and 3 of TB102. Terminals 1 and 2 should be used for a nominal 115 V. source.

The meter on the receiver/transmitter front panel will read the AC output from power transformer T106 when the meter switch S203 is in the LINE VOLTAGE position. Observe the meter reading and rotate POWER LINE switch S104 for a reading on the meter within the LINE mark. This LINE mark indicates a nominal voltage of 115 volts. It is desirable to exceed the 115V indication by a small amount, if necessary, rather than to set the switch for a possible large drop below the desired reading. S104 is calibrated to indicate the approximate increase or decrease the tap positions will cause in the output voltage of T106. *M201 is not calibrated in volts.*

Transformer T107 supplies 6.3 volts AC to the crystal ovens. It is also the current source for operation of keying relay, K101. T107 is fused in its primary circuit by F105, a 0.5 ampere 3 AG fuse.

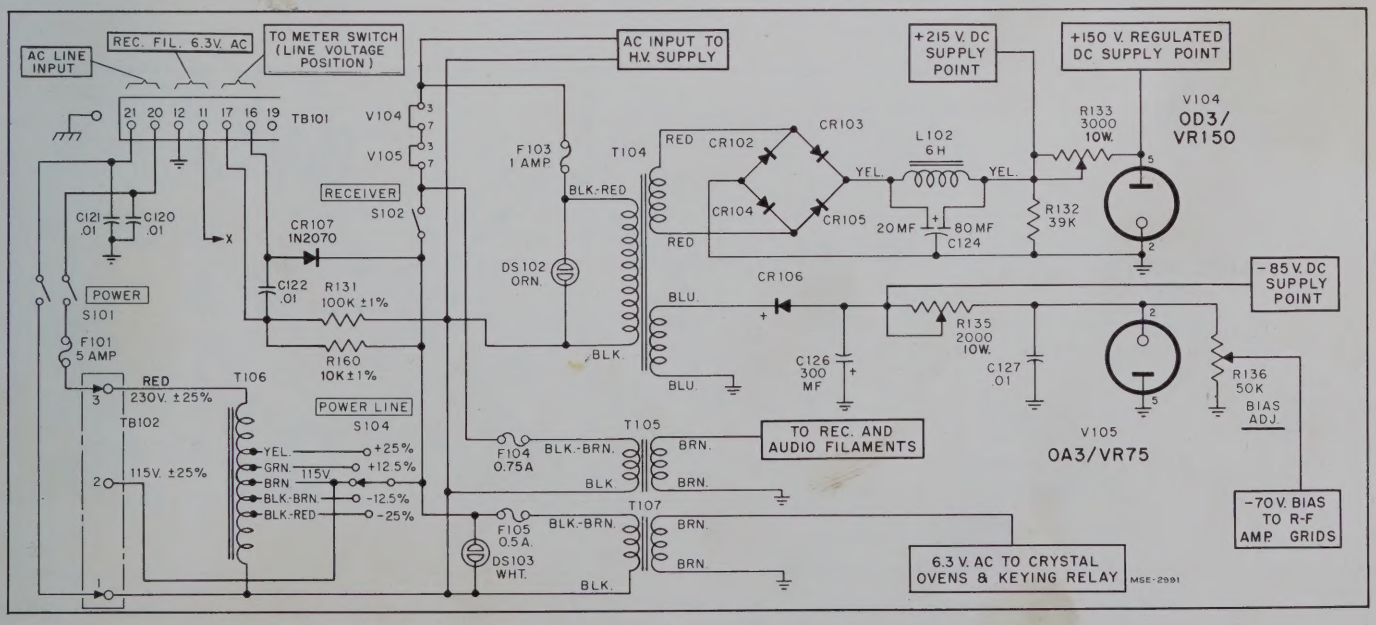


Fig. 26—Schematic Diagram, Low Voltage Power Supplies

S102 applies AC input voltage to filament transformer T105 and Low Voltage transformer T104.

Transformer T105 supplies 6.3 V AC filament voltage for all the tubes in the receiver section and the power unit audio tubes. This transformer also supplies 6.3 V AC to the VOK-10 relay and, when used, the selective ringer. T105 is fused in its primary circuit by F104, a 0.75 ampere 3 AG fuse.

The low voltage power transformer T104, has two secondary windings. One winding supplies voltage for the negative bias and −85V DC sources. The second winding supplies voltage for the +215 volt DC and +150 V. Regulated DC voltage sources.

The secondary AC voltage from the lower winding of T104 is rectified by CR106 and then filtered by capacitor C126. The −85V DC feeds from this point as shown in figure 26. This voltage is also applied to the bias regulator (V105) across capacitor C127. This capacitor charges to a predetermined voltage level controlled by adjustable resistor R135. This resistor adjusts the operating level of the regulator tube, V105. The bias control, R136, adjusts the −70 volt negative bias. This bias is fed to the grids of the transmitter 6146 Power Amplifier output tubes.

AC voltage from the upper secondary winding of T104 is rectified by a bridge rectifier circuit, which consists of silicon rectifiers CR102, CR103, CR104 and CR105. The rectified voltage is then filtered and smoothed by choke L102 and a dual section capacitor C124. This is the source of +215 V as shown in figure 26. R132 is the bleeder across the +215 V supply. The +215 V. is fed to the OD3/VR150 voltage regulator tube (V104) through R133. R133 sets the operating level of V104 to obtain +150V regulated DC output.

The links in the AC line at T104 are internal jumpers in the voltage regulator tubes V104 and V105. With either tube removed from its socket, the AC supply source to T104 and the HV supply, is disconnected, and operation of either the receiver or transmitter is prevented. This avoids accidental application of HV to the transmitter without low voltages and bias being present.

HIGH VOLTAGE SUPPLY

The schematic diagram, figure 27, shows the high voltage supply circuits.

The TRANSMITTER switch, S103, applies AC input voltage to transformers T101 and T102. Both transformers are fused by F102, a 3 ampere 3AG slow-blo fuse. Transformer T101 supplies 6.3 V AC filament voltage to the tubes in the transmitter.

T102 is the power transformer for the transmitter high voltage supply. The AC at the secondary of T102 is rectified by a multi-element bridge rectifier which consists of 16 silicon rectifiers and an equal number of 330,000-ohm balancing resistors. The bridge rectifier circuits used here, and in the low voltage supply have many advantages. Increased reliability is insured by the use of silicon diode rectifiers. These circuits also supply higher voltages since the full secondary voltage of the transformer is rectified rather than only half the voltage as in conventional tube type full wave circuits using a center-tapped transformer.

Choke L101 and capacitors C117, C118 and C119 smooth and filter the rectified output. Resistors R128, R129 and R130 form the bleeder for the high voltage supply. The high voltage power supply provides 750 volts DC for the plates of the 6146 Power Amplifier output tubes V201, V202 and V203.

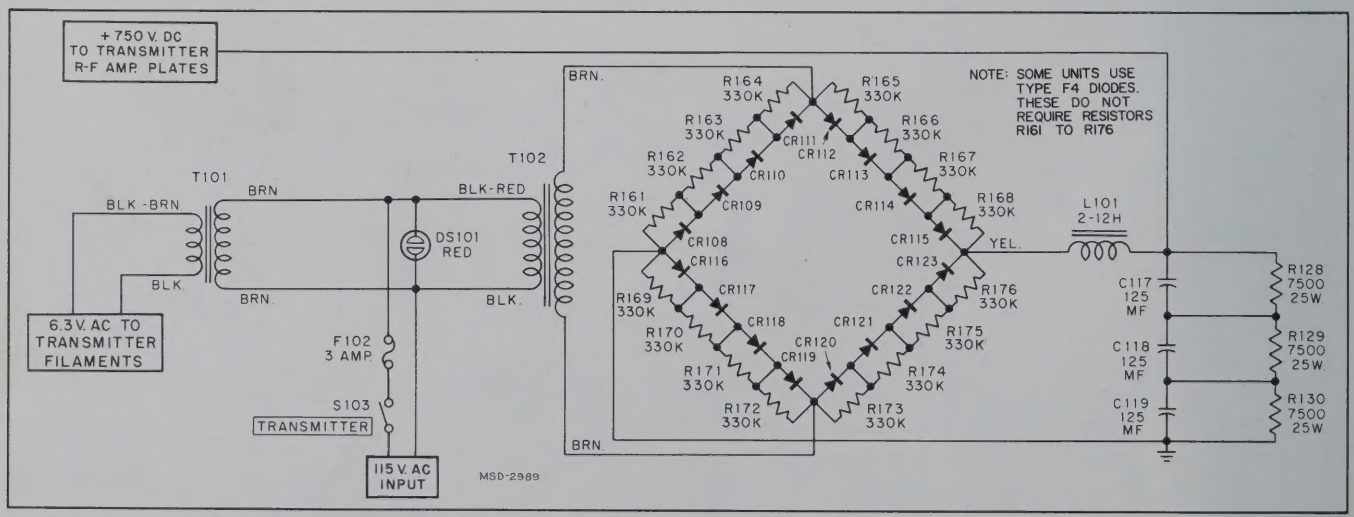


Fig. 27—Schematic Diagram, High Voltage Power Supply

AUDIO OUTPUT

Two separate audio output stages are employed in the SSB-1 Mark IV.

The circuits for these stages are shown in figure 28.

One triode section of a 12AT7 (V103B) is used as a line amplifier. The function of this tube is to amplify a portion of the audio output from the receiver and feed this signal to the line amplifier V106, a 6AK6. V106 further amplifies the signal and feeds it to the 600-ohm line output through an output transformer, T108. The signal level fed to V103B is controlled by the line level control, R368, located on the transmitter/receiver chassis.

V103B also acts as an intercom amplifier, permitting remote intercom communications through the 600-ohm line connections.

A second 6AK6 pentode amplifier, V107, is the audio output stage for the local and remote handsets and the local speaker or headphones. It also supplies audio output for operation of selective ringing or teleprinted terminal equipments used with the SSB-1 Mark IV.

The output of V107 is controlled by R139, the speaker volume potentiometer. This control adjusts output signal level from the audio stage in the receiver section. Output from V107 is fed to the various functions through output transformer T109. A test point, TP101, is provided at the secondary of T109 for use in measurement of the overall receiver output.

AUTOMATIC VOICE OPERATION

The power supply section of the SSB-1 Mark IV includes a circuit to provide automatic switching between transmit and receive using only a voice or audio signal for operation.

When an accessory unit (VOK-10) is installed in the VOK receptacle (J102) and switch S106 is in the VOK position, the automatic voice control circuit enables the voice or audio signal to actuate relay K102. When the contacts of K102 close, the keying relay, K101, changes from the receive to the transmit position and actuates relays K201 and K202, the changeover relays in the transmitter/receiver unit.

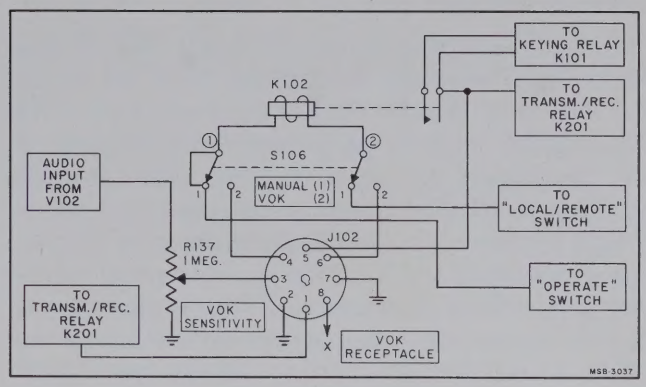


Fig. 29—Automatic Voice Operation Circuits

Figure 29 shows the connections to the VOK receptacle. Audio, from the speech clipper (V102) is applied to the voice control circuit through R137, a 1 megohm potentiometer. R137, the VOK sensitivity control, varies the audio level at which relay K102 will actuate.

Automatic voice control operation may be accomplished from the local position or any remote deskset position. In addition automatic control is possible using an audio signal from the 600-ohm line input. This eliminates the necessity for the local operator to monitor and manually switch between receive and transmit during line operation.

The VOK-10 accessory unit is described on pages 35 and 81.

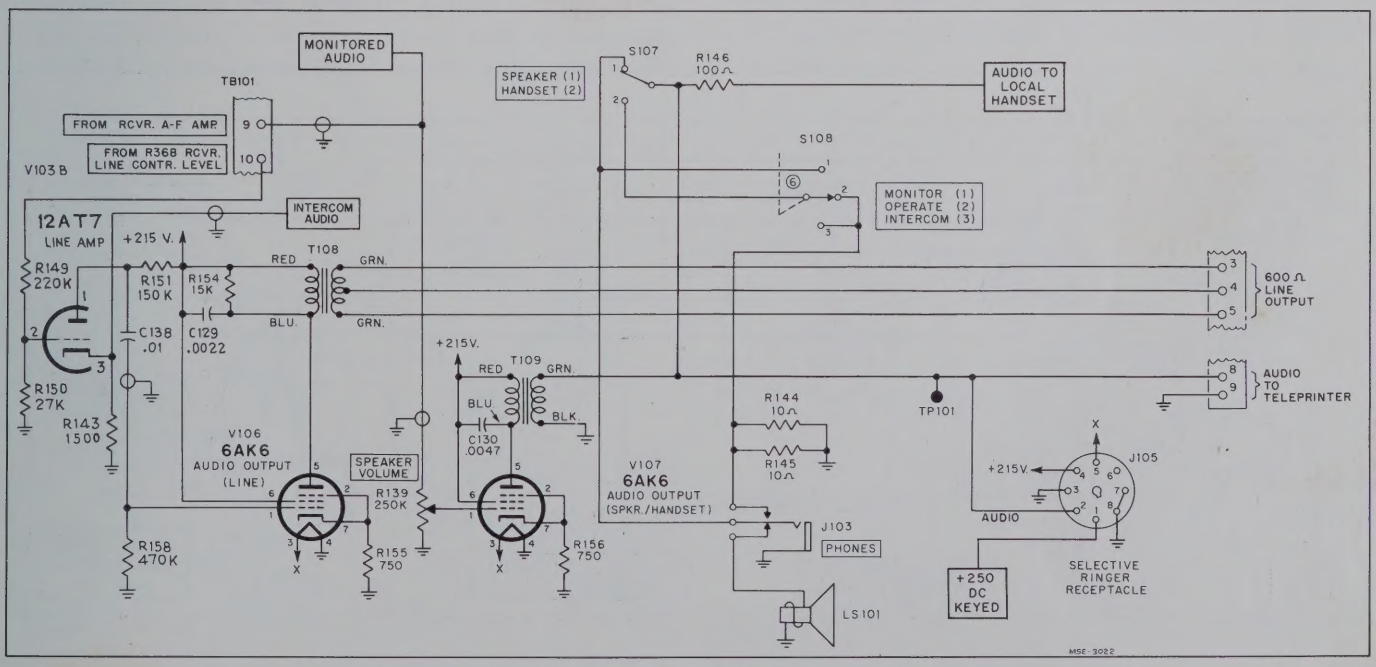


Fig. 28—Schematic Diagram, Audio Output Circuits

TONE OSCILLATOR

A 12AT7 tube, V103A, is employed as a 1000 cps tone oscillator for telegraph transmission. With the TELEPHONE-TELEGRAPH/TELETYPE switch, S105, in the TELEPHONE position the grid of V103A is grounded and the oscillator is inoperative. When S105 is switched to TELEGRAPH/TELETYPE the ground on the grid of V103A is removed. In addition, the series resistor/capacitor circuit (R120 and C116) on the lower contact of the keying relay K101 is grounded. When the keying relay K101 is not energized, the tone oscillator is held at cut-off by the high bias developed by cathode resistor R122 (10K).

When the controls of the hand telegraph key are closed they provide a ground return for the keying relay thus energizing this relay. The keying relay contacts perform two functions. The upper set of contacts ground the tone oscillator cathode resistor R122 as shown in Figure 30.

This places the oscillator, V103A, in operation and generates a 1000 cps tone signal which is fed to the input of the pre-amplifier tube V101B. The lower set of contacts on K101 provide the ground return for the transmit/receive relays K201 and K202. When these controls are closed the transmit/receive relays are energized, and the transmitter becomes operative.

Telegraph "Break-in" operation of the SSB-1 Mk. IV is possible with a minimum number of transfers of the transmit/receive relays. The capacitor-resistor network R120/C116 previously mentioned acts as a delay circuit during keying. At normal keying speeds, capacitor C116 charges through R120 to hold the transmit/receive relays closed during "key-up" intervals of normal short duration. This relieves the transmit/receive relays from following exactly the "make" and "break" of the key contacts. Any pause in keying, longer than the normal rate, will permit the transmit/receive relays to de-energize and the equipment then returns to the receive condition.

The tone oscillator, V103A can also be employed when teleprinter equipment is used with the SSB-1 Mark IV. Figure 30 shows the ground return for the transmit receive relays, K201 and K202, connected to the send/receive switch on the teleprinter equipment. Closing the switch ("send" position) completes the ground return for K201 and K202 and transfers the SSB-1 equipment to transmit.

As previously described, grounding R122 (shown in Figure 30) places V103 in operation and supplies a 1000 cps tone signal to the audio preamplifier. A teleprinter transmitter properly connected to this point (R122/C115) also performs this grounding function, keying the tone oscillator on and off.

Teletype code represents each character as a five item group of signal or no-signal units, normally referred to as "marks" and "spaces." A teleprinter transmitter, by alternately grounding and ungrounding this point, causes the tone oscillator V103 to produce 1000 cps tone or no-tone segments conforming to the Teletype code. This information is then fed to the preamplifier as in hand telegraph keying. The delay circuit R120/C116 *is not* employed during teleprinter transmission since relays K201 and K202 remain energized during the entire sending period. To deenergize the keying relays and to allow the SSB-1 Mk. IV to receive, the teleprinter send/receive switch must be opened ("receive" position).

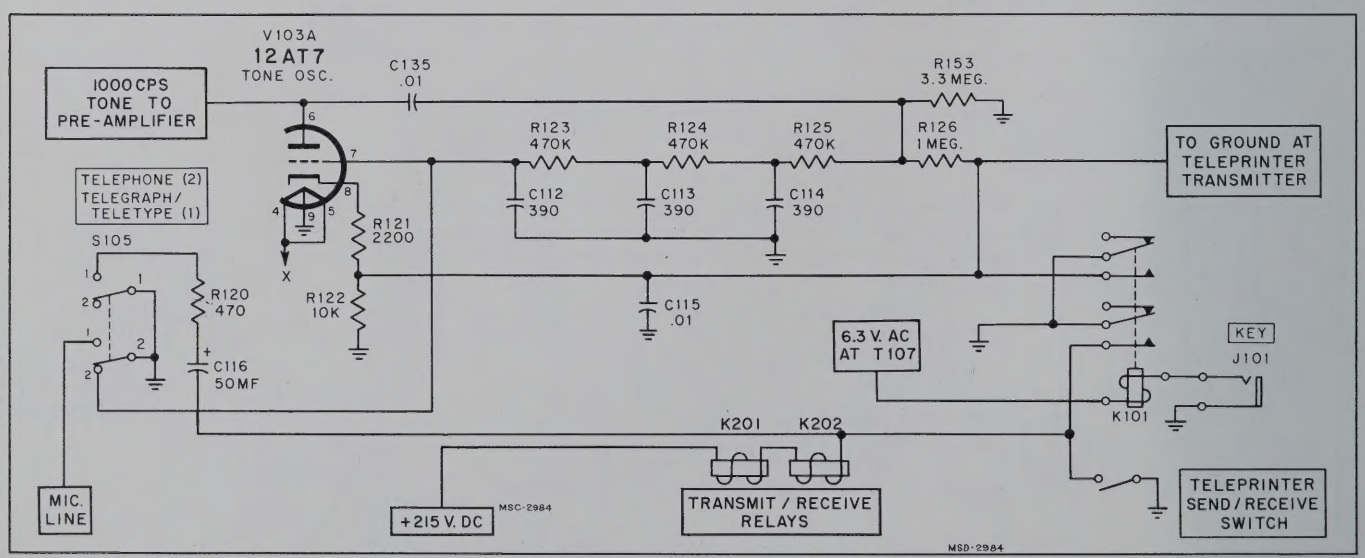


Fig. 30—Schematic Diagram, Tone Oscillator

PRE-AMPLIFIER, CLIPPER AND AUDIO AMPLIFIER

Both the audio signal from the microphone, and the 1000 cps tone signal from the tone oscillator (when telegraph operation is employed) are fed to the input of V101B, a low-gain microphone preamplifier.

The audio present at the input of V101B is fed back as a sidetone to the remote location handset being operated.

As shown in figure 31, the output of V101B feeds to the dual-diode 6AL5 speech clipper, V102. The speech clipper permits operation at a high average speech level without overmodulation on high audio peaks. This provides increased intelligibility and higher average power output from the transmitter.

The output of V102 is fed to V101A, the triode A-F amplifier. The output of V102 is also fed to the VOK-10 relay socket for speech controlled operation of the equipment when the optional VOK-10 unit is inserted in the socket.

The audio output of the triode amplifier V101A is fed to the audio amplifier in the transmitter/receiver section. When S108 is in the MONITOR position, the audio signal at V101A is also fed to the output tube V107, for monitoring by the local operator of signals originating from a REMOTE or LINE location.

SWITCHES, RELAYS AND SIGNALLING DEVICES

Switches

Refer to the block diagram, page 26.

Switch S101 (POWER) in the AC input line is the main power switch which controls power to all sections of the equipment. Turning S101 ON, with all other switches in their OFF positions, applies voltage to the line transformer T106 and crystal oven transformer, T107. It also feeds 6.3 volts AC to the keying relay K101. AC is also supplied to the meter rectifier CR107, to indicate the AC input voltage present. This permits switch S104 to be adjusted for 115 V input to all supply inputs.

S104 (POWER LINE) is the AC input control switch. It is connected to taps on the line transformer. The equipment is designed to operate with AC input voltage of 115 volts to all transformers, etc. S104 is used to select the correct tap on the line transformer so that approximately 115 V is present at the switch output, even though the AC source voltage may be anywhere between 80 and 300 volts AC.

Switch S102 (RECEIVER) applies AC to the low voltage supply input at T104 and to the receiver and audio filament transformer, T105. It also feeds AC to transmitter switch, S103.

S103 (TRANSMITTER) is the transmitter power switch. It applies AC input voltage to the transmitter filament transformer, T101 and also to T102, the high-voltage transformer for the transmitter. No voltage is present at switch S103 until the receiver switch S102 has been turned on. This arrangement prevents high voltage being applied to the transmitter without low voltages and bias voltage being present.

Switch S107 is the SPEAKER/HANDSET switch and is used to cut the speaker in or out. In the HANDSET position, S107 switches in the parallel resistance network R144/R145 for the OPERATE and INTERCOM functions. These resistors insure that a load is always present on the audio output transformer, T109, whether this network, the speaker, or headphones are used. The load is present with any combination of switch positions selected by S107 and S108. With S108 in the MONITOR position the speaker is always connected regardless of the position of S107.

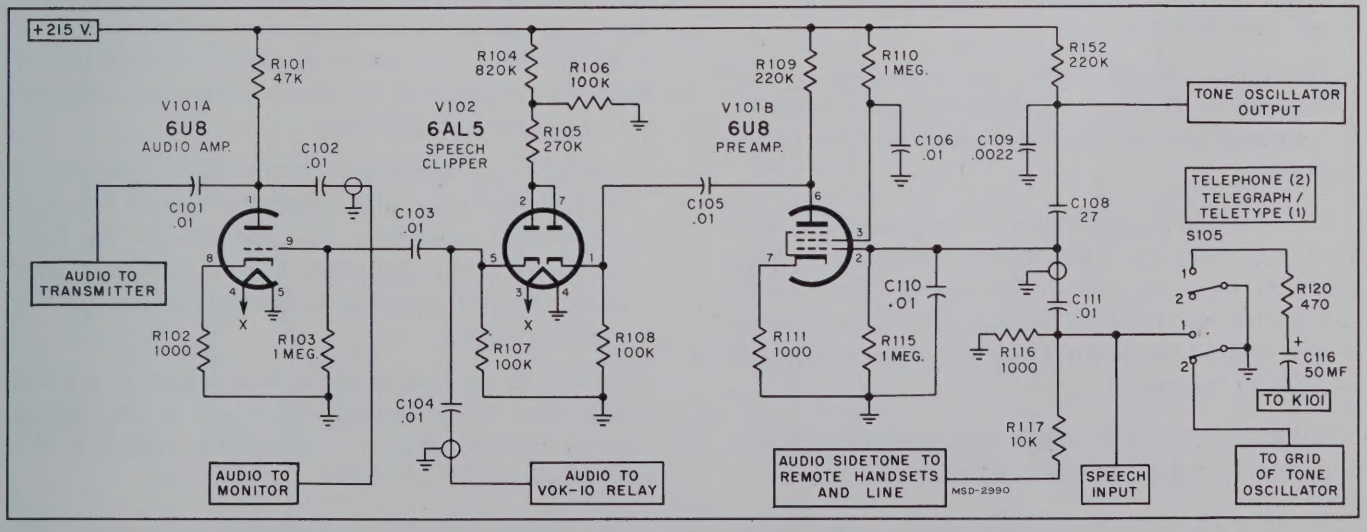


Fig. 31—Schematic Diagram, Pre-Amplifier, Speech Clipper, Audio Amplifier

Switch S108 is used to select the desired function of MONITOR, OPERATE or INTERCOM. It switches all circuits concerned with whatever function is selected.

The LOCAL/REMOTE switch, S109, switches all circuits involved from LOCAL, to any one of the three REMOTE locations, or to the 600-ohm line.

Switch S105 selects circuits for either TELEPHONE or TELEGRAPH/TELETYPE operation. In the telephone position its function is to ground the grid of the tone oscillator, V103A, making the oscillator inoperative. In the TELEGRAPH/TELETYPE position it removes the ground on the V103A grid and switches in the delay circuit, R120/C116. The function of this circuit is explained in detail under "TONE OSCILLATOR," page 30.

The MANUAL/VOK switch, S106, controls the ground return for relay K102. The return is fed either through the VOK-10 relay for voice keying in switch position #2 or to one of the P/T handset buttons in switch position #1 for press-to-talk keying.

Relays

Relay K102 is used to close the ground return for the transmit/receive relays K201 and K202. It is controlled by having its own ground return completed by either the VOK-10 relay or by the P/T button on the LOCAL, or one of the REMOTE handsets.

K101 is the keying relay and its ground return is completed when a hand telegraph key, plugged into jack, J101, is closed. The contacts of this relay perform two functions: One, to complete the ground return for the transmit/receive relays, K201 and K202, when telegraph transmission is used, and the other to bridge resistor R122 and permit the tone oscillator to function during telegraph operation.

Lights and Buzzers

The buzzer, DS108, at the "local" position is a signalling device to attract the local operator's attention. It is actuated by a switch on any one of the three remote handsets.

There are seven signal lights on the power unit. They all employ neon type bulbs and are connected to either 115 V AC or to the +215 V DC supply. DS101, DS102 and DS103 use 115 V AC as their supply source, while DS104, DS105, DS106 and DS107 are supplied from the +215 V DC source.

DS101 is a red signal light which, when lighted, indicates that the transmitter is turned on.

DS102 is an orange signal light which, when lighted, indicates that the receiver is turned on.

DS103 is a white signal light which, when lighted, indicates that the main power switch is turned on.

Switching of the power unit is so arranged that DS102 (POWER) lights when the power switch is thrown. DS102 (RECEIVER) and DS101 (TRANSMITTER) will not light before DS103 (POWER). DS102 (RECEIVER) and DS103 (POWER) must both be on before DS101 (TRANSMITTER) will light.

Signal lights DS104, DS105 and DS106 are lights at the local position, one for each of the three remote locations. The appropriate signal light, for any given location, lights when an operator at that remote location lifts his handset from its cradle and the local remote switch is set to the position corresponding to this remote light.

DS107 is a signal light at the local position which, when lighted, indicates to the local operator that the LOCAL/REMOTE switch, S109, is turned to the LINE position.

Switches, lights and buzzers on remote equipment are explained in the description of the particular equipment.

Accessory Equipment

Remote Desksets

The remote deskset is equipped to provide operation and signalling from a remote location. The symbols referred to are shown in figure 25 which details the remote deskset for remote #1 location.

DS501 is a buzzer on the remote deskset base. This buzzer is actuated by the local operator's P/T button to signal the remote location.

DS502 is a push button switch on the remote deskset used to operate the buzzer DS108 at the local position to signal the local operator.

DS503, on the base of the remote deskset, is a red signal light which is actuated whenever the transmitter is operated from any remote location or the local or line locations. It signifies to the remote location operator that the transmitter is in operation.

NOTE:—A signal light, DS201, on the transmitter/receiver front panel also is lighted whenever the transmitter is in operation. This indicates to the local operator that the equipment is in the "transmit" condition, whether operation is controlled locally or from a remote position.

DS504, on the base of the remote deskset, is a white signal light. When lighted it indicates to the remote location operator, that he is connected through to the local position.

The cradle contacts on the remote deskset perform two functions. The upper set of contacts close the ground

return line for relay K102 through to the P/T button on the remote handset. Pressing the P/T button on the remote handset completes the ground return circuit for relay K102. The lower contacts on the remote handset cradle complete the circuit which feeds +215 V DC to the signal light DS106 at the local position. DS106 is the signal light for remote position #1. When lighted it notifies the local operator that the handset at remote #1 location has been removed from its cradle.

NOTE:—The LOCAL/REMOTE switch, S109, must be turned to remote position #1 as shown in figure 25, to allow DS106 to light. Switch S109 must be turned to the remote position involved before the light for that remote position will light at the local position.

Selective Ringer

The RCA Selective Ringer is the receiving and indicating unit of the Selective Ringer/Calling signalling system. The purpose of the Selective Ringer is to decode the two-tone audio-frequency signal transmitted by the Selective Calling Unit. When connected to SSB-1 Mk. IV equipment, the Selective Ringer/Calling Units can be used to call any other radio telephone in a system equipped with the selective signalling units.

A receptacle (J105) is provided on the rear of the Mk. IV power supply chassis to accommodate the plug of the Selective Ringer. This receptacle supplies all the necessary voltages and the received two-tone signals. Pin 1 of J105 is connected to +215 volts keyed DC. Pin 2 supplies the audio signals; pins 3, 7 and 8 are grounded; pin 4 supplies +215 volts; pin 5 supplies 6.3 volts AC; and pin 6 has no connections.

The signals received by the Selective Ringer are composed of alternate tone signals of 600 and 1500 cycles. These tone signals are coupled to two resonant circuits in the Ringer by transformer T201. See figure 32.

L101, C101 and C102 comprise the tuned circuit for the 1500-cycle tone signal. A bridge rectifier composed of IN34A crystal diodes rectifies the signal voltage and causes a current to flow in winding 3-8 of K101. A similar circuit for the 600-cycle tone signal causes a current to flow in winding 4-7 of K101.

K101, a polarized relay, has three windings. The two windings already mentioned are wound in opposite directions. The magnetic flux created by the tone signals will attract or repel the armature of K101 depending on the frequency of the tone.

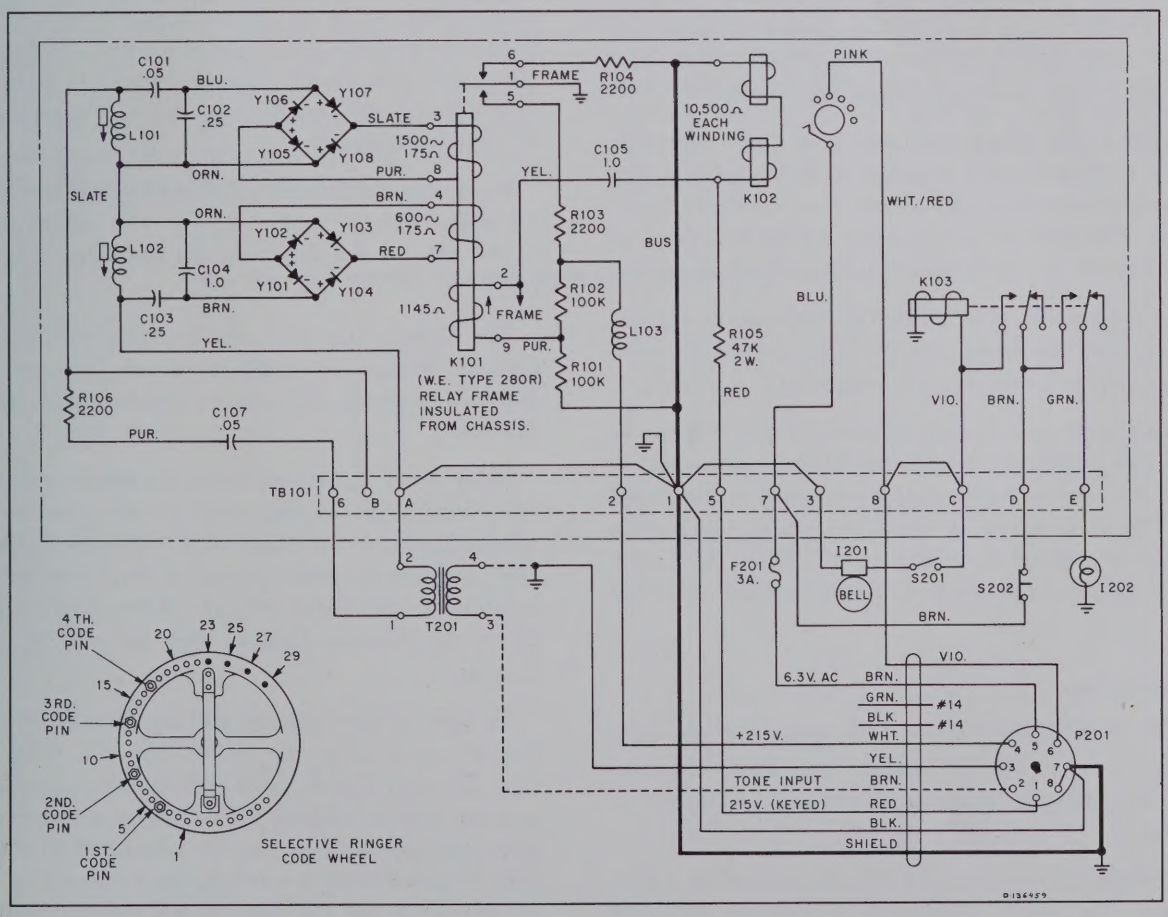


Fig. 32—Schematic Diagram, RCA Selective Ringer and Code Wheel

The third winding (2-9) is connected to B-plus via voltage divider R101 and R102. The purpose of this winding is to polarize the relay after each alternation of the relay to maintain the last made contact until the next alternation occurs. If the relay were not polarized in this manner, the armature would return to a neutral position after each tone signal.

The alternations of the polarized relay charge and discharge capacitor C-105 through the windings of K102, a stepping relay. K102 can be present to respond to a predetermined code number composed of five digits. When the correct sequence of tone signals is received, the stepping relay moves a code wheel through five latching positions and makes an electrical contact at the last latching position. The electrical contact completes a circuit that rings the signalling bell (I201) and lights the indicator lamp (I202).

When a five-digit number is transmitted by the Mk. IV transmitter, all Selective Ringers in the network will be actuated. However, all Ringers, except the one being called, will fail to ring because their code wheels will not latch on all code pins and the electrical contact will not be reached.

When the electrical contact of the code wheel is reached, 6.3 volts AC is applied to relay K103 and bell I201 (through switch S201). A set of contacts on K103 holds the relay closed; another set applies 6.3 volts AC to lamp I202. The lamp is extinguished by pressing switch S202. S202 also deenergizes relay K103.

The SSB-1 Mk. IV receiver should be "on" when the Selective Calling/Ringer equipment is to be used. Set the Channel selector to the channel on which calls are expected. The receiver gain control should be advanced slightly beyond the position used for normal reception.

When the number is called that corresponds to the one preset on the code wheel, the indicator lamp will light and the alarm bell will ring (if switch S101 is closed).

The call is answered in the normal manner. When the push-to-talk button is pressed, the Ringer code wheel is reset to the normal starting position ready to be called again. The code wheel is unlatched when +215 volts keyed DC is applied at terminal 5 of TB101. This voltage trips the relay one more time and unlatches the code wheel.

Selective Caller

The RCA Selective Calling Unit generates the two-tone signals required to operate the RCA Selective Ringer. A schematic diagram of this unit is shown in figure 33.

One triode section of a 12AT7 tube is used as a tone oscillator. The other section is a cathode follower coupled to the oscillator section. The cathode resistor

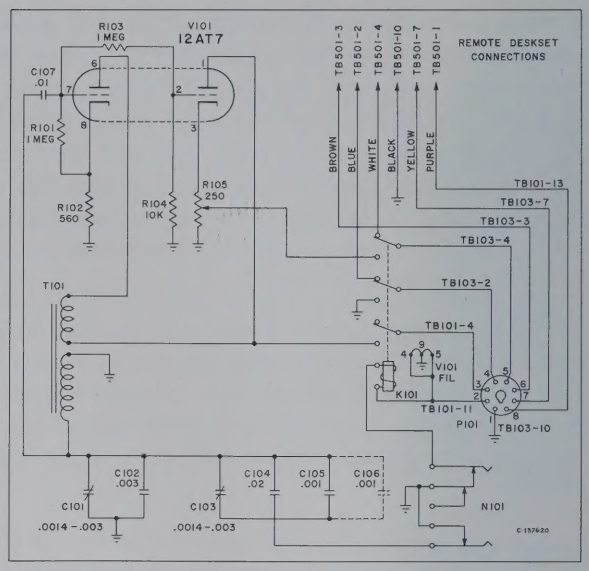


Fig. 33—Schematic Diagram, Selective Caller

of the cathode follower is adjustable and is used to set the level of the two-tone signals.

Adjustable capacitors in the grid circuit of the tone oscillator determine the frequency of oscillation. The contacts of a telephone-type dial alternately make and break the ground connection for capacitors C103, C104, C105 and C106. When these capacitors are connected to ground, the oscillator frequency generated is 600 cycles. When the ground connection is opened, the frequency is 1500 cycles. Therefore, when a number is dialed, a two-tone signal is generated composed of alternate pulses of 600 and 1500 cycles.

Power for the Selective Calling Unit is obtained from the SSB-1 Mk. IV power supply. The cable connections to the Mk. IV are shown in the schematic diagram, figure 33.

The Calling Unit may also be connected to a Remote Deskset. When connected as shown, only one cable is required between the remote location and the SSB-1 Mk. IV.

Relay K101 is actuated when a number is dialed. This relay causes the keying relay to key the transmitter; applies B-plus to the plates of V101 in the Calling Unit; and connects the tone output of the Caller to the preamplifier of the SSB-1 Mk. IV. When K101 is not energized, the Remote Deskset may be used in a normal manner.

To operate the Selective Calling Unit from a Remote Deskset or locally, the SSB-1 Mk. IV POWER, RECEIVER, and TRANSMITTER switches should be "on" and the LOCAL-REMOTE switch set to a remote position corresponding to the one connected to the Calling Unit. When dialing a number, the handset may be on or off the cradle but the press-to-talk button should not be depressed.

Voice-Operated Relay

The RCA VOK-10 Voice-operated Relay is a small unit containing all of the necessary circuits to actuate the keying relay of the SSB-1 Mk. IV transmitter by merely speaking into the microphone. This unit, designed specifically for the SSB-1 Mk. IV, provides a versatility and convenience of operation approaching the simplicity of common telephone usage. The VOK-10 not only relieves the operator from the use of the push-to-talk button, but also relieves the operator from the necessity of monitoring transmissions and switching from transmit to receive when transmissions originate at a remote land-line telephone.

The VOK-10 unit is easily installed. It is simply plugged into an octal socket provided on the power supply chassis of the SSB-1 Mk. IV. The octal socket, J102, provides all power and operating signals for the single tube used in the unit. A schematic diagram of the VOK-10 unit is shown in figure 34.

The pentode section of a 6U8A tube, shown in figure 34, amplifies the audio signals from the speech clipper. The amplified audio signal is rectified by CR401 and CR402 and filtered by C403 and C405. The resultant positive voltage overcomes the fixed bias on the grid of the triode section of the 6U8A tube. The positive voltage on the grid causes the triode to conduct. The plate load of the triode is the winding of relay K102 (in the Mk. IV). When the tube conducts, the relay is actuated causing the keying relay (K101) to change from a receive condition to transmit. When there is a pause in speech, the plate current is cut off within a fraction of a second and the Mk. IV reverts to a receive condition.

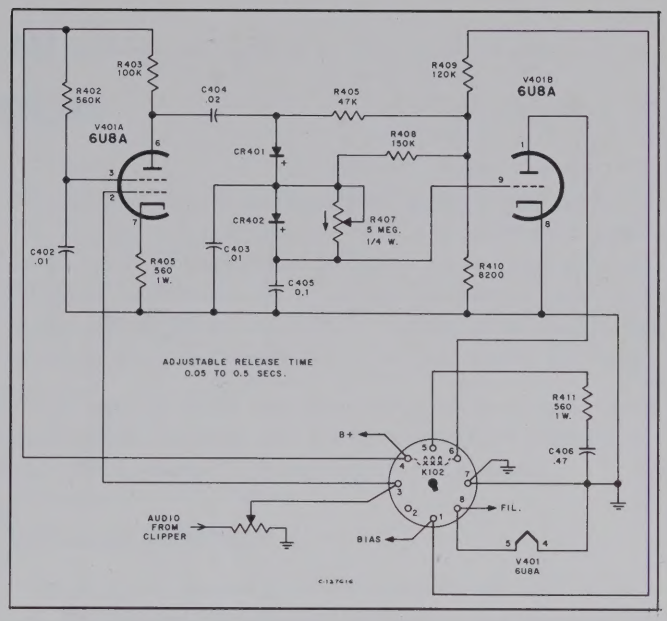


Fig. 34—Schematic Diagram, VOK-10 Unit

The sensitivity of the voice-operated relay may be adjusted by R137 (VOK-10 SENSITIVITY) located on the Mk. IV front panel. When the sensitivity control is turned clockwise, the audio level to the VOK-10 is increased causing the voice-operated relay to respond to a lower level of speech.

An adjustment is provided on the VOK-10 unit to control the release time of relay K102. R407, a 5 megohm adjustable resistor, can be varied to change the time constant of the resistor/capacitor combination of R407 and C405. This adjustment of R407 will vary the release time from 0.05 to 0.5 seconds.

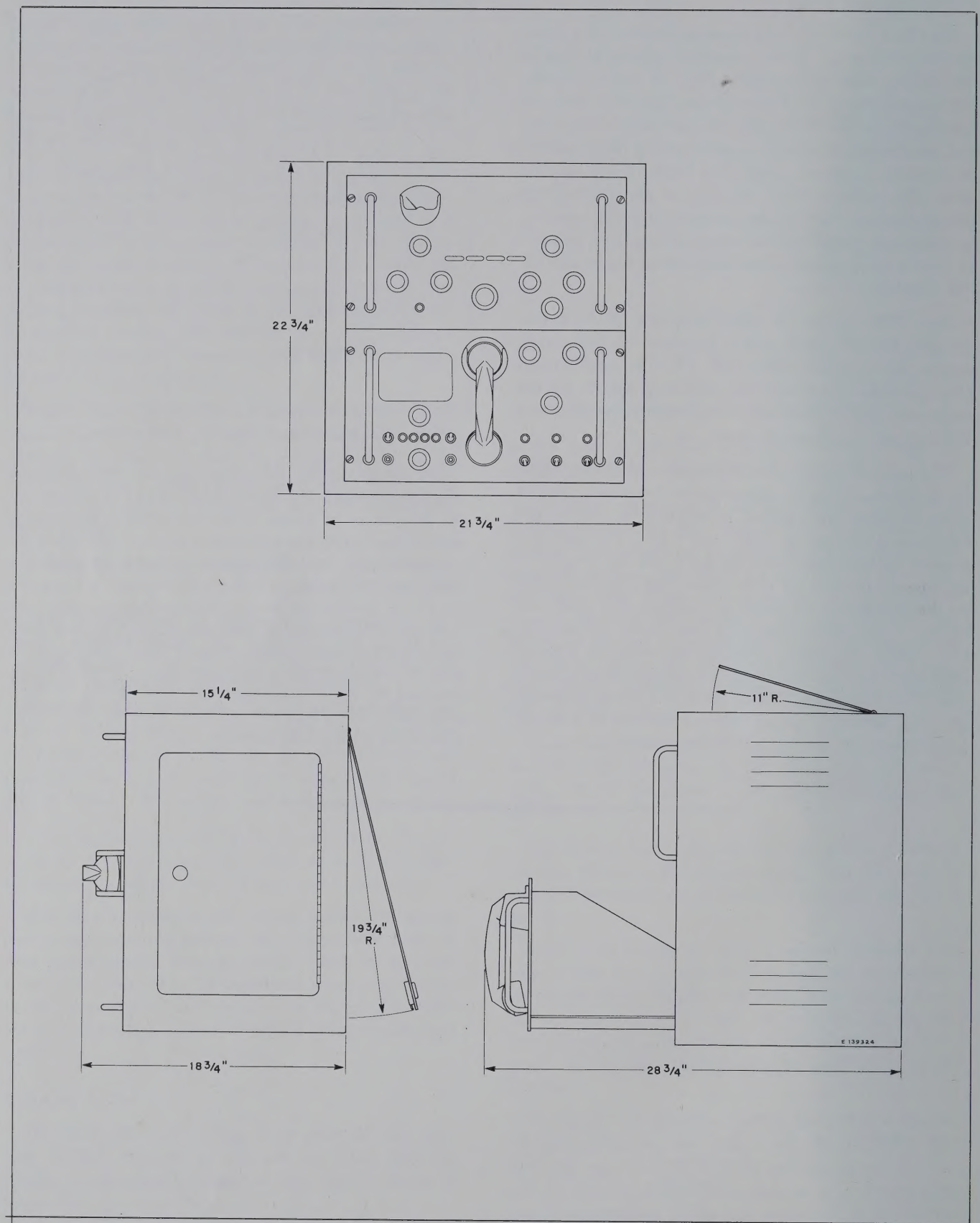


Fig. 35—Outline Dimensions, SSB-1 Mark IV

Section IV
INSTALLATION

LOCATION AND MOUNTING

The SSB-1 Mk. IV communication equipment may be mounted on a desk or table, or other suitable surface affording a mounting area of 22⅜ ins. wide by 18¾ ins. deep. A minimum clearance of 11 ins. is required at the top of the cabinet to permit the top panel to be fully opened. A minimum clearance of 18¾ ins. is required at the rear of the cabinet to permit full opening of the rear door. Figure 35 shows the outline dimensions of the equipment.

When locating the SSB-1 Mk. IV equipment provide sufficient space for the removal of the chassis from the cabinet for inspection or servicing. It is also important to have free circulation of air around the equipment. Installations in closets or other confined areas should be avoided.

Other considerations when locating communications equipment are: Convenience to AC power; routing of antenna and ground wires; the location of associated equipment; the proximity of interfering structures (see page 53). *(Absorption Fading.)*

POWER SOURCE

The AC supply line voltage for the SSB-1 Mk. IV equipment may be within ±25% or 115 volts or 230 volts. Before the AC power line is connected to terminals 20 and 21 of TB101, the proper connections should be made to TB102.

Terminal board TB102 is located underneath the power supply chassis. See Figure 62 on page 75. For operation on 115 volts AC, the spade connectors should be securely fastened to terminals 1 and 2 of TB102. For operation on 230 volts AC, the connectors are fastened to terminals 1 and 3.

T106 is an autotransformer with five taps; two above and two below the center tap position of 115 volts. This circuit arrangement provides a means of compensating for a high or low line voltage to the extent of ±25%. After the proper connections have been made to TB102 and power has been applied, the POWER LINE switch, S104, is adjusted to the mark on the front panel meter (115 volts).

GROUND CONNECTION

A connection should be made from the ground terminal at the rear of the transmitter-receiver chassis to a good ground (earth) with a heavy flexible copper wire or copper strap. A good outdoor ground may be made by driving a 6-foot length of 1-inch pipe into moist earth. If it is impractical to make an outdoor ground, a secure connection to a copper cold-water pipe will suffice. If possible, connection to the pipe should be made at the point where the water pipe enters the earth.

All ground wires should be made as short and direct as practical. A long ground wire may have a detuning effect and require a shortening of the antenna.

ANTENNA SYSTEM

Satisfactory operation of a transmitter depends largely on the proper choice and location of an antenna. A single-wire antenna installed at the highest practical location above ground is easy to construct and works well with the SSB-1 Mk. IV Transmitter.

The length of an antenna of this type should be one-quarter of a wavelength at the highest channel frequency. The chart in figure 36 shows the length of wire necessary for a given frequency. The length of wire indicated on the chart is the overall length of the antenna measured from the antenna standoff terminal E204 to the far end of the wire.

When four channel frequencies are used, the highest frequency will determine the length of the antenna. Then, when the SSB-1 Mk. IV is operated on one of the lower frequencies the antenna will be capacitive and the antenna loading coil in the unit will resonate the antenna. In this way, the antenna can be tuned to any frequency within the range of the equipment.

Dipole antennas are also recommended for use with the SSB-1 Mk. IV transmitter and receiver. Half-wave dipoles may be cut to length from the following formula:

$$\text{length (feet)} = \frac{468}{\text{frequency (mcs.)}}$$

The half-wave dipole antenna consists of a wire (#14 or #12 AWG copper) cut to length from the formula given above and supported at each end by glass or ceramic insulators.

Halfway between the two insulators the wire is cut and another insulator is inserted. In effect, two antennas, each one-quarter wavelength long, are created. Each conductor of a balanced transmission line (two wire, or coxial twin-lead) is connected to each side of the center insulator, thus one conductor of the transmission line is connected to one half of the dipole, and the other conductor is connected to the other half of the dipole. See figure 37. In most instances, dipole antennas cut to frequency can be used on one channel only.

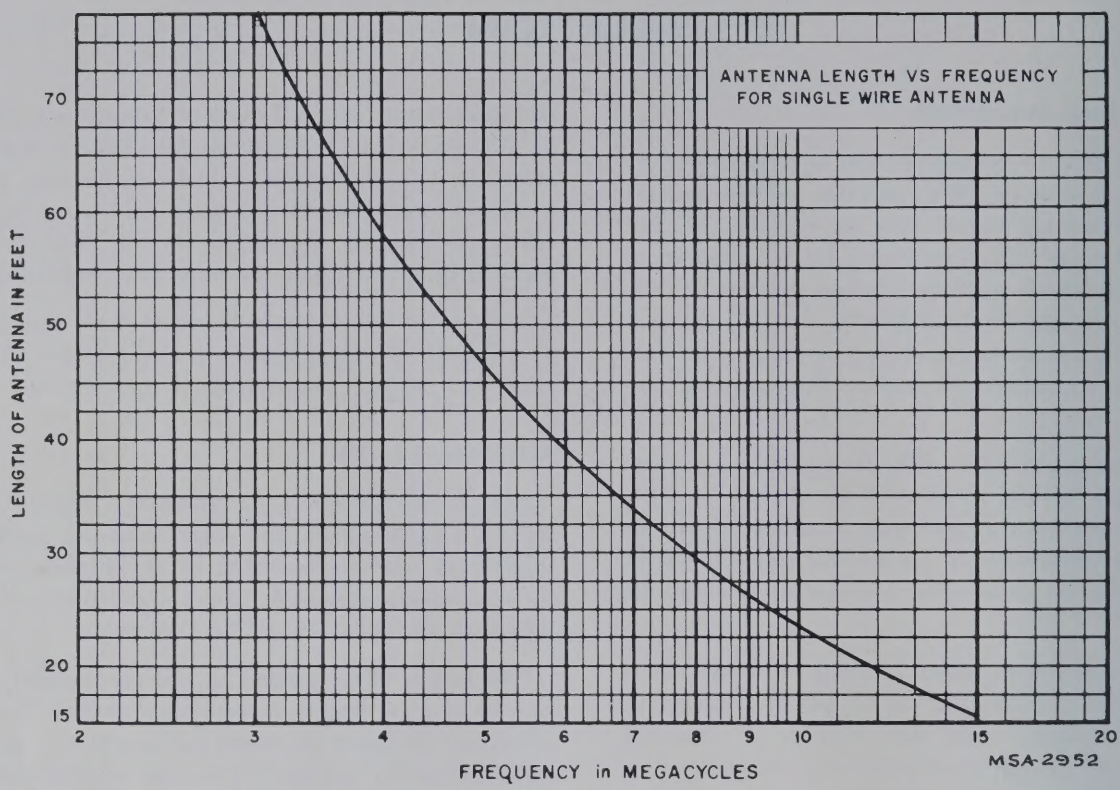


Fig. 36—Antenna Length vs Frequency, Single Wire Antenna

Another type of unbalanced transmission line connection is the end-fed connection. This type of connection is similar to balanced feed except that the antenna is fed at one end instead of the center. The leads of the transmission line are separated by an insulator and connected to the extreme end of the antenna. The supporting insulator for the antenna should be connected as shown in figure 37b. When coaxial shielded transmission line is used with these antennas the shield and conductor are connected as shown in figure 37.

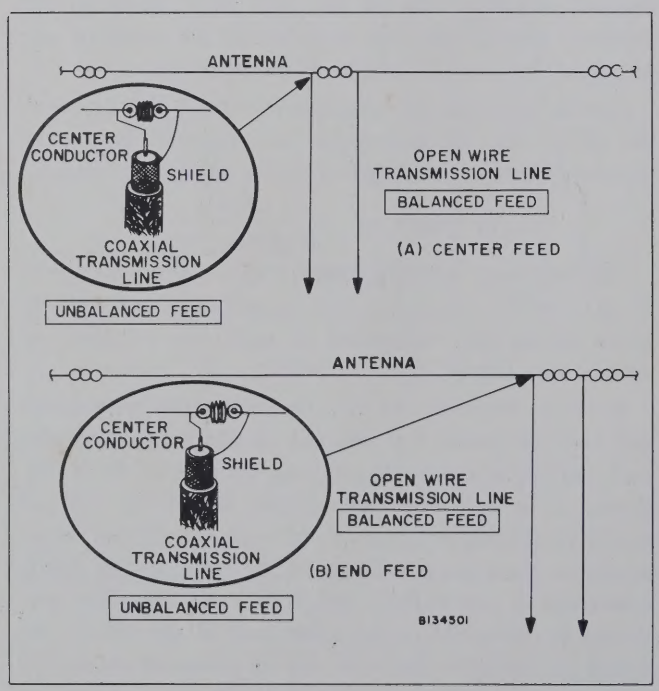
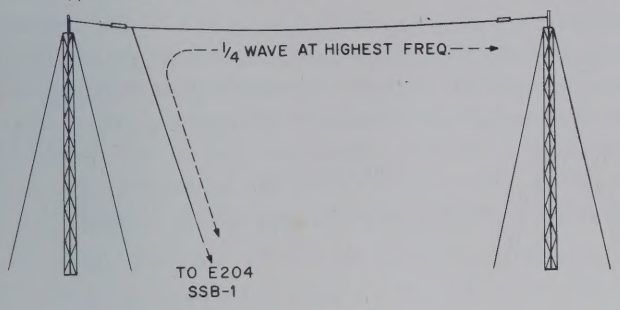
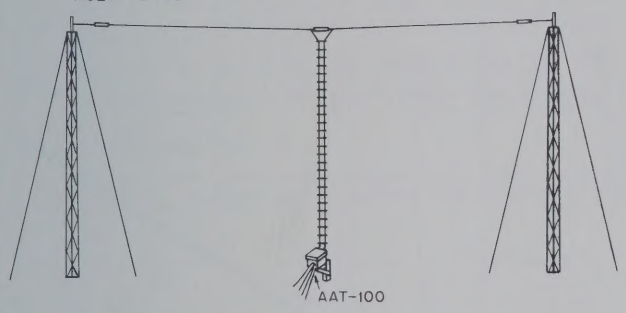
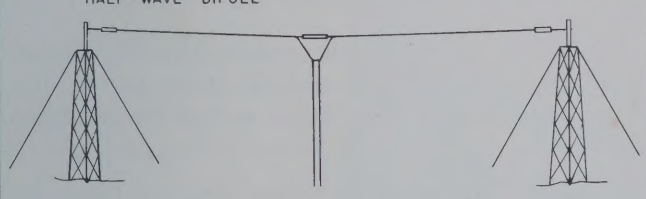
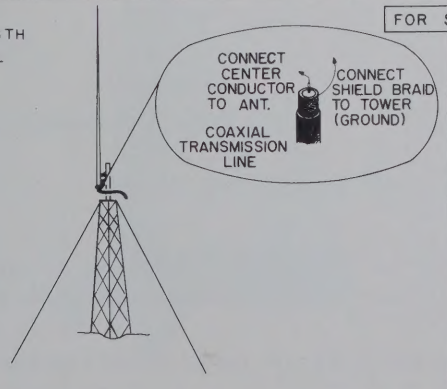


Fig. 37—End-fed and Center-fed Antennas

Other antenna systems are shown in figure 38. Of special interest is the multi-channel dipole antenna using the RCA AAT-100 Automatic Antenna Tuner. This tuner is an automatically operated matching device providing a pre-set impedance match between the SSB-1 Mk. IV and a 78-foot dipole antenna, at four pre-set frequencies in the 3 to 15 megacycle range. RF connection between the tuner and the SSB-1 Mk. IV is made with RG8/U coaxial cable attached to J201 on the SSB-1, and a coaxial fitting on the tuner unit. A 450-ohm open-wire line (supplied with the tuner) connects the tuner to the 78-foot dipole (also supplied with the tuner).

Automatic impedance matching is accomplished by switch settings selected by a motor in the tuner unit. This switching motor is controlled through a 5-wire cable connected from one segment of the channel switch (S201K) at TB202, on the rear apron of the transmitter/receiver unit, to a connector on the antenna tuner unit. Thus, when channels are switched in the SSB-1 Mk. IV, the antenna system is automatically matched.

ANTENNA TYPE	LENGTH	TRANSMISSION LINE	CONNECTIONS TO SSB-1 MARK IV
FOR 4 CHANNEL USE ¼ WAVELENGTH SINGLE WIRE  	3500 kc (CHAN 1) 66 3/4 FT. 7500 kc (CHAN. 3) 31 ¼ FT. 13500 kc (CHAN 4) 17 ¼ FT.	(PART OF ANT.)	TERM. E204
FOR 4 CHANNEL USE MULTI-BAND  	78 FEET AS SUPPLIED WITH RCA AAT-100 AUTOMATIC ANTENNA TUNER.	450 OHM OPEN WIRE (SUPPLIED)	COAXIAL FITTING J201
FOR SINGLE CHANNEL USE HALF-WAVE DIPOLE 	3500 kc. (CHAN. 1) 133 3/4 FT. 7500 kc (CHAN. 3) 62 ½ FT. 13500 kc (CHAN. 4) 34 ½ FT.	72 OHM TWIN LEAD OR 72 OHM COAXIAL	TERM. E204 AND GROUND COAXIAL FITTING J201
FOR SINGLE CHANNEL USE ¼ WAVELENGTH VERTICAL  	13500 kc. (CHAN. 4) 17¼ FT. 15000 kc. (CHAN. 4) 15½ FT.	50 OHM COAXIAL	COAXIAL FITTING J201

E-7393-2

Fig. 38—Types of Antennas used with the SSB-1 Mark IV

CRYSTALS

The SSB-1 Mk. IV uses the following crystals:

CRYSTAL	FREQ.	FUNCTION	REMARKS
Y207	250 kc.	CW OSC. (CARRIER)	SUPPLIED
Y205	1150 kc.	LSB OSC.	SUPPLIED
Y206	1650 kc.	USB OSC.	SUPPLIED
Y201, Y202	*	CHAN. 1 & 2 R-F OSC.	
Y203, Y204	*	CHAN. 3 & 4 R-F OSC.	*see text

The channel frequency crystals, Y201 to Y204, are *not* supplied with the SSB-1 Mk. IV unless requested by special order. The crystal holders (ovens) *are* supplied.

If 5600.250 KCS is the lowest frequency channel to be received, the 7000.250 KC. crystal should be inserted in crystal oven E202 in the position indicated for the channel 1 crystal.

Use the following guide to determine the crystal to use for a particular channel.

CRYSTAL FREQUENCY	CHANNEL NUMBER	CRYSTAL OVEN
4400 to 8900 kc.	1 or 2	E202
8900 to 16,400 kc.	3 or 4	E201

Install channel crystals as follows:

1. Remove the proper crystal oven as determined by the above chart.
2. Loosen the screw on the side of the oven; twist cover counter-clockwise ↺ and lift off.
3. Remove the thumb screw from the hold-down bracket. See figure 39.

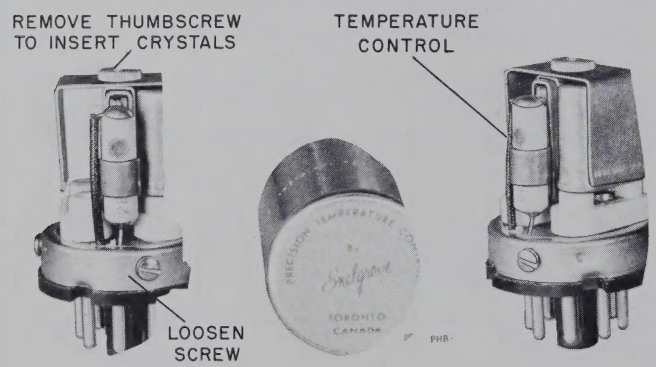


Fig. 39—Installation of Crystals in Oven

4. Insert the crystals in the proper sockets; replace bracket and oven cover.
5. Replace crystal oven in its socket.

In the space provided above the CHANNEL selector on the front panel, write the nominal carrier frequencies of the channels (crystal frequency *minus* 1400 kcs. and crystal correction).

CRYSTAL ORDERING DATA

When ordering crystals, a correction to the desired frequency should be added to compensate for the difference between the capacitance used in crystal testing and the stray capacitance existing under operating conditions. Failure to add these correction values may result in frequency differences detrimental to satisfactory communication. See figure 40 for correction values.

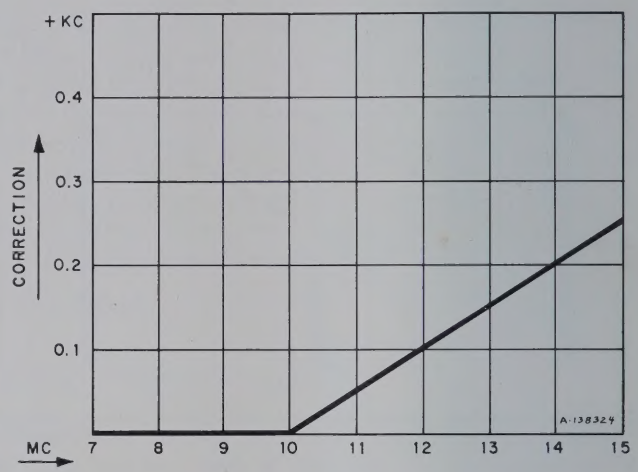


Fig. 40—Crystal Frequency Correction Chart

To use the chart, select the carrier frequency desired from the horizontal line, read *up* to the curved line. From that point read *to the left* to find the correction value.

Example: To calculate the crystal frequency for operation at 12,000 kc:

12,000 kc
add 1400
13,400
add 0000.10 (from chart, figure 40)
order crystal at 13,400.1 kc

CAUTION: When ordering crystals specify that they are for use in RCA type SSB-1 Mk. IV equipment. Also indicate the frequency the crystal is to be "cut to" and the intended operating frequency. In the example given where operation is to be on 12,000 kc specify:

"1 crystal, type CR27/U, for use in RCA type SSB-1 Mk. IV, cut to 13,400.1 kc for operation on 12,000 kc."

The "cut to" frequency is the desired channel frequency plus the required additions and corrections.

TRANSMITTER TUNING PROCEDURE

GENERAL

After the channel frequency crystals have been installed, as described under CRYSTALS, check to make sure that all tubes are firmly seated in their sockets; all tube shields are in place; the cap connections to the power amplifier tubes are secure; taps on the plate tank coil (L202) and the antenna loading coil (L201) are not shorting to each other or to other turns of the coils; and that a secure ground connection is made to the chassis.

CAUTION

HIGH VOLTAGES ARE PRESENT IN THIS EQUIPMENT. EXERCISE CAUTION WHEN PERFORMING THE TUNING PROCEDURES. BEFORE APPLYING POWER MAKE CERTAIN THAT THE EQUIPMENT HAS BEEN PROPERLY GROUNDED AND THAT CONNECTIONS TO THE POWER TRANSFORMER HAVE BEEN MADE IN ACCORDANCE WITH THE PREVIOUS PARAGRAPHS.

All tuning adjustment locations are shown in figure 41.

When tuning the transmitter, a dummy load or a suitable antenna, as described in the preceding paragraphs, should be connected to the appropriate antenna terminals on the TRANSMITTER/RECEIVER chassis. The transmitter should not be operated without a suitable "load" connected to the antenna terminals because, during the tuning procedure, excessively high voltages and/or currents may be developed in the power amplifier output circuits and may cause damage to the equipment.

A "dummy load" is preferred during initial tuning adjustments. This type of load prevents unwanted radiation from interfering with other communication channels. A suitable dummy load consists of a non-inductive resistor having a wattage rating equivalent to the power output of the transmitter. A 50-ohm 100 watt resistor is recommended for the SSB-1 Mark IV. The dummy load is connected with a short length of wire (six inches) to a male coaxial connector and should be connected to J201, the 50-ohm output terminal of the power amplifier. If a suitable dummy load is not available an ordinary 150-watt light-bulb connected in the same manner as above may be used instead.

Illumination of the light bulb when the transmitter is tuned indicates that R-F power is present in the PA output circuits. The comparative brilliance of the bulb indicates, *roughly*, the power output.

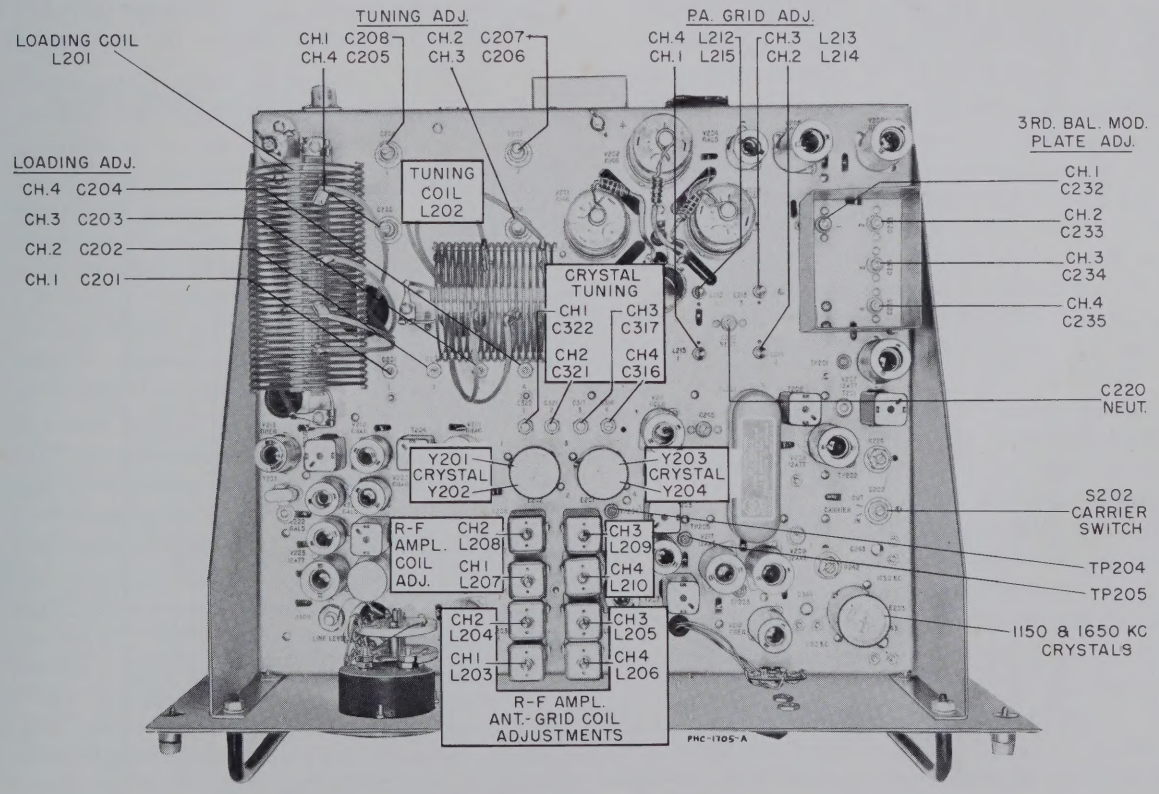


Fig. 41—Top View, Transmitter/Receiver Chassis, showing Tuning Adjustments

PRELIMINARY ADJUSTMENTS

1. ALL POWER SWITCHES "OFF".
2. Place switch (S) on the front panel in MONITOR.
3. In the lower left corner at the rear of the power supply chassis, adjust R136 fully clockwise; this is a slotted-shaft control and should be adjusted with a screwdriver.
4. Place switch (P) on the front panel in the TELEGRAPH position.
5. Connect a telegraph key by inserting the phone plug connected to the key into the jack marked "KEY" on the front panel. When making adjustments the key should be depressed to obtain a meter reading.
6. Position tap #1 (tap connectors are marked with channel number) at the approximate number of turns from the "cold" end of PA tuning coil L202 indicated by the chart, figure 42. The "cold" end of the coil is the end nearest to the ANTENNA TUNING coil, L201. Position the remaining taps for channels 2, 3 and 4 according to the number of turns indicated on the chart.
7. Turn C201, C202, C203 and C204 fully counter-clockwise. (Maximum capacitance.)

BALANCED MODULATOR TUNING

1. Place meter switch (G) in the BAL. MOD. TUNE position.
2. Throw switches (J) (POWER), (K) (RECEIVER), and (L) (TRANSMITTER), to the "ON" position.
3. Adjust C232 (channel 1) for a peak reading on the meter. The peak reading should occur below 100. To decrease meter reading, turn the transmitter gain control counter-clockwise. For other channels, adjust C233 (channel 2), C234 (channel 3) and C235 (channel 4). These capacitors are located inside the open-top shield at the right rear corner of the top chassis.

   NOTE:—Check for correct peak by decreasing the TRANSMITTER GAIN control. Meter reading should decrease — if it does not, readjust the capacitor for correct peak.

   THE ALIGNMENT TOOL SUPPLIED WITH THE EQUIPMENT SHOULD BE USED IN MAKING THIS ADJUSTMENT.

INTERMEDIATE PA TUNING

1. Place meter switch (G) in IPA TUNE position.
2. Pre-set the IPA tuning slugs as shown in figure 43. Adjust L215 (channel 1) for a peak reading on the meter. The peak reading should occur below 100. To decrease meter reading, turn the transmitter gain control counter-clockwise. For other channels, adjust L214 (channel 2), L213 (channel 3) and L212 (channel 4).

POWER AMPLIFIER TUNING

1. Place meter switch (G) to PA TUNE.
2. Adjust TRANSMITTER GAIN (B) to zero.
3. Adjust R136 (see Step 3 *prelim. adj.* for location) for a reading of 35 on the meter. Check TRANSMITTER GAIN control for increase in meter reading.
4. Place meter switch (G) to MOD. LEVEL.

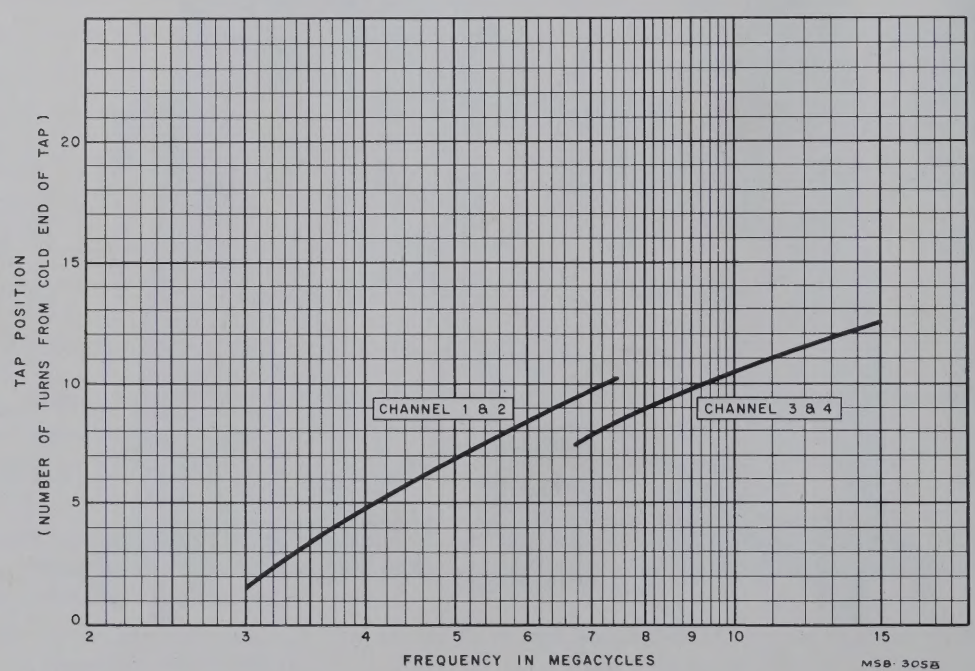


Fig. 42—Tap Positions of Plate Tank Coil L202

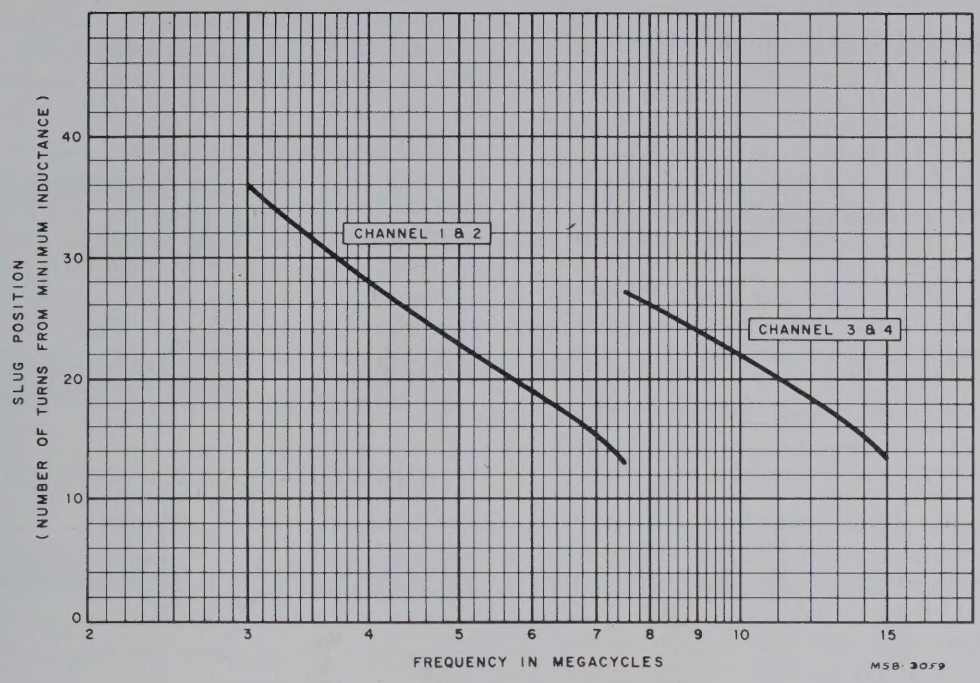


Fig. 43—Slug Positions of IPA Tuning Inductances

5. Adjust TRANSMITTER GAIN (B) for a reading of 100 on the meter.
6. Place meter switch (G) to PA TUNE.
7. Adjust C208 (channel 1) for minimum reading on the meter. For other channels adjust C207 (channel 2), C206 (channel 3) and C205 (channel 4).
8. Place meter switch (G) to MOD. LEVEL.
9. Increase TRANSMITTER GAIN control (B) for a reading of 200 on the meter.
10. Place meter switch (G) to PA TUNE. If meter reads less than 120, adjust C201 slightly in a clockwise direction and adjust C208 for a minimum reading. When the minimum reading is 120 in PA TUNE coincident with a reading of 200 in MOD. LEVEL, the transmitter is fully loaded. Repeat for each channel, using the appropriate capacitors.
11. If meter reading is *in excess* of 120 turn C201 slightly counter-clockwise and adjust C208 for a dip in the meter reading. Continue until a fully loaded condition exists.
12. The position of the tap on L202 (for the channel being tuned) will affect loading of the transmitter. Too much inductance (tap too far towards the "cold" end of coil) will result in an overloaded indication with a very slight dip in the meter. Too little inductance (tap too close to the "hot" end of coil) will give a sharp dip and the transmitter will not load fully. If either of these conditions occur, and loading cannot be accomlished with rotation of the tuning capacitor in either direction, the tap should be moved, in small increments, until proper loading is accomplished.

ANTENNA TUNING

NOTE:—This procedure is used when operating the transmitter into a single-wire or other antenna connected to terminal E204, or to E204 and ground.

Antennas normally connected with coaxial cable transmission line to the coaxial fitting, J201, are usually cut to length so that at the frequency desired the 50-ohm output impedance of the SSB-1 Mark IV transmitter is properly matched. Such antennas are normally used for single channel operation. When an external antenna tuner (such as the RCA AAT-100) is used, antenna tuning is accomplished in the tuner unit. In such installations the taps for L201, the antenna tuning coil, should be placed on the first turn of the coil (nearest the front panel) and not moved during tuning.

1. After the tuning procedures above have been completed, throw the TRANSMITTER power switch (L) to the "OFF" position. Remove the dummy load. When making the ANTENNA TUNING COIL adjustments the antenna to be placed in actual use should be connected to the appropriate antenna terminals.
2. Place meter switch (G) in the PA TUNE position.
3. Place the taps 1, 2, 3, and 4, on the ANTENNA TUNING coil, on the coil turn nearest the antenna connection terminal E204.
4. Connect the antenna. Turn on the TRANSMITTER switch. Set TRANSMITTER GAIN control to 0.
5. Press the telegraph key. Note the meter reading.
6. Change tap 1 of ANTENNA TUNING COIL

L201, one turn at a time, away from the antenna end of the coil. After each turn, press telegraph key and note the meter reading. Continue this procedure until a peak reading is reached. The antenna circuit is now properly tuned to the desired frequency. Readjust PA PLATE TUNING CAP 1 (C208) for a dip in the meter reading. Only a slight variation of the capacitor should be required if the antenna circuit has been properly resonated.

NOTE:—If unable to note any rise in the meter reading as the antenna coil tap is changed, increase coupling to the antenna circuit by rotating ANTENNA COUPLING CAP 1 (C201) clockwise one or two turns, retune PA PLATE TUNING CAP 1 (C208) for dip in meter reading and repeat procedure as on paragraphs 5 and 6.

7. Depress the key. Place meter switch in MOD. LEVEL position. Increase TRANSMITTER GAIN until the meter reads 200. Full load conditions exist when the meter reads 200 in the MOD. LEVEL position coincident with a meter reading of 120 in the PA TUNE position.

8. If the meter reads 200 in the MOD. LEVEL position coincidentally with a PA TUNE reading below 120, an undercoupled condition exists. Adjust ANTENNA COUPLING CAP 1 (C201) clockwise in small increments. After each increment, dip the meter reading (PA TUNE) by adjusting PA PLATE TUNING CAP 1 (C208), and raise the TRANSMITTER GAIN control until a full-load condition exists.

9. If the MOD. LEVEL reading is 200 coincidentally with a PA TUNE reading above 120 (step 7 above), an overcoupled condition exists. Adjust ANTENNA COUPLING CAP 1 (C201) counter-clockwise in small increments. After each increment, dip the meter reading (PA TUNE) by adjusting PA PLATE TUNING CAP 1 (C208), and adjust the TRANSMITTER GAIN control until a full-load condition exists.

10. If a full-load condition cannot be obtained, vary PA PLATE TUNING COIL (L202), tap 1. Change the tap position one or two turns and repeat the procedures of steps 4 through 10, above.

11. Tune channels 2, 3 and 4 using the respective circuit elements and following the procedures of steps 1 through 10, above. If difficulty is experienced in loading the highest frequency channel refer to the ANTENNA section for correct antenna length.

NOTE:—In some instances (generally when using an antenna tuner) normal clockwise rotation of capacitors C201 to C204 may not result in a fully loaded condition. If this occurs, proper loading can usually be accomplished by *counter-clockwise* rotation of these capacitors.

RECEIVER TUNING PROCEDURE

The coils of the R-F amplifier will require adjustment whenever new R-F crystals are installed to change the channel frequency or when crystals are installed for the first time.

A preliminary tuning of each coil can be made by counting the number of turns made with the alignment tool while adjusting the position of the threaded brass core. The following table should be used to determine the approximate number of turns (starting from a fully counter clockwise position) for a given R-F frequency. THE R-F FREQUENCY IS THE CHANNEL FREQUENCY — NOT THE CRYSTAL FREQUENCY.

All tuning adjustments are shown in figure 41.

ADJUSTMENTS OF R-F AMPL. GRID AND PLATE COILS

APPROX. CHANNEL FREQUENCY (KC)		NUMBER OF CLOCKWISE TURNS (FROM MIN.)	
		L203	*L207*
CHAN. 1	3000	39.0	39.0
	4250	25.5	25.5
		L204	*L208*
CHAN. 2	4250	25.5	24.5
	7500	8.0	7.0
		L205	*L209*
CHAN. 3	7500	32.0	32.0
	9500	20.5	21.0
		L206	*L210*
CHAN. 4	9500	22.0	21.0
	14,500	5.0	4.0

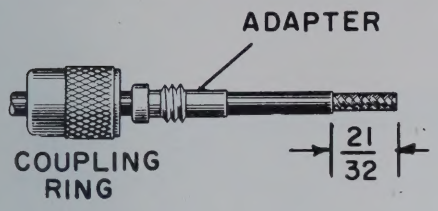
For final adjustments connect an R-F signal generator to the antenna terminals at the rear of the receiver. Connect a vacuum tube voltmeter to TP205 (grid #3, V216). Adjust respective cores for maximum reading at frequency desired.

NETWORK TUNING

When it is desired to operate several stations as a network, the transmitters and receivers of all stations should be tuned to exactly the same frequency.

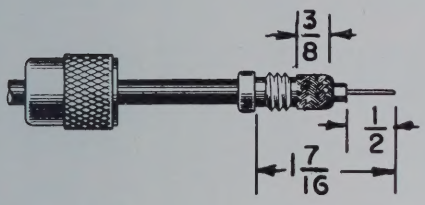
For netting, the channel frequency crystals and sideband positions (upper or lower) should be pre-determined. All stations are then tuned to the master, or "net control" station. To do this, the net control station, with its transmitter and receiver properly tuned, and with the Speech Clarifier control set to the mid-range position, should call each of the stations in the net. Each net station, when called, should have the Speech Clarifier control set to the mid-range position. With the receiver/transmitter unit partially withdrawn from the cabinet, capacitors C322, C321, C316, C317 (depending upon the channel used) should be adjusted, with the tuning tool provided, until the received speech from the net control station becomes clear and distinct. Figure 41 shows the location of these adjustments.

ASSEMBLY OF AMPHENOL 83-1SP PLUG AND 83-168 ADAPTER TO RG-59/U COAXIAL CABLE

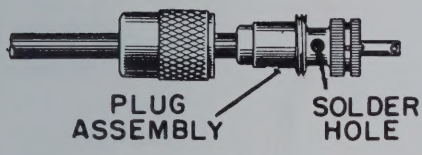


Remove 21/32" of vinyl jacket from cable.
Slide coupling ring and adapter on cable.

Spread braid and fold back over cable.



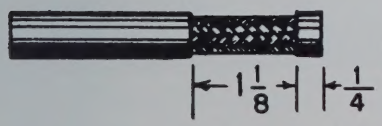
Position adapter as shown at left. Trim braid to 3/8" and press down over the adapter. Remove 1/2" of dielectric material. Tin center conductor.



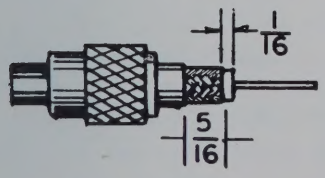
Screw inner plug assembly onto adapter.
Solder braid to shell through solder holes.
Solder center conductor.

Screw shell onto inner plug assembly.

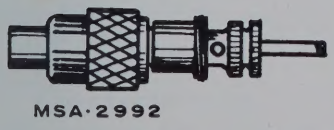
ASSEMBLY OF AMPHENOL 83-1SP PLUG TO RG-11/U COAXIAL CABLE



Remove 1 1/8" of vinyl jacket from cable.
Tin braid evenly and smoothly with thin coating of solder.



Cut braid, using small pipe cutter or sharp knife, leaving 5/16" as shown at left. Remove dielectric material, leaving 1/16". Take care not to cut the center conductor. Replace shell on cable.



Screw inner plug assembly onto cable. Solder to braid at solder holes. Solder center conductor.

Fig. 44—Assembly Procedure for Coaxial Cable Fittings

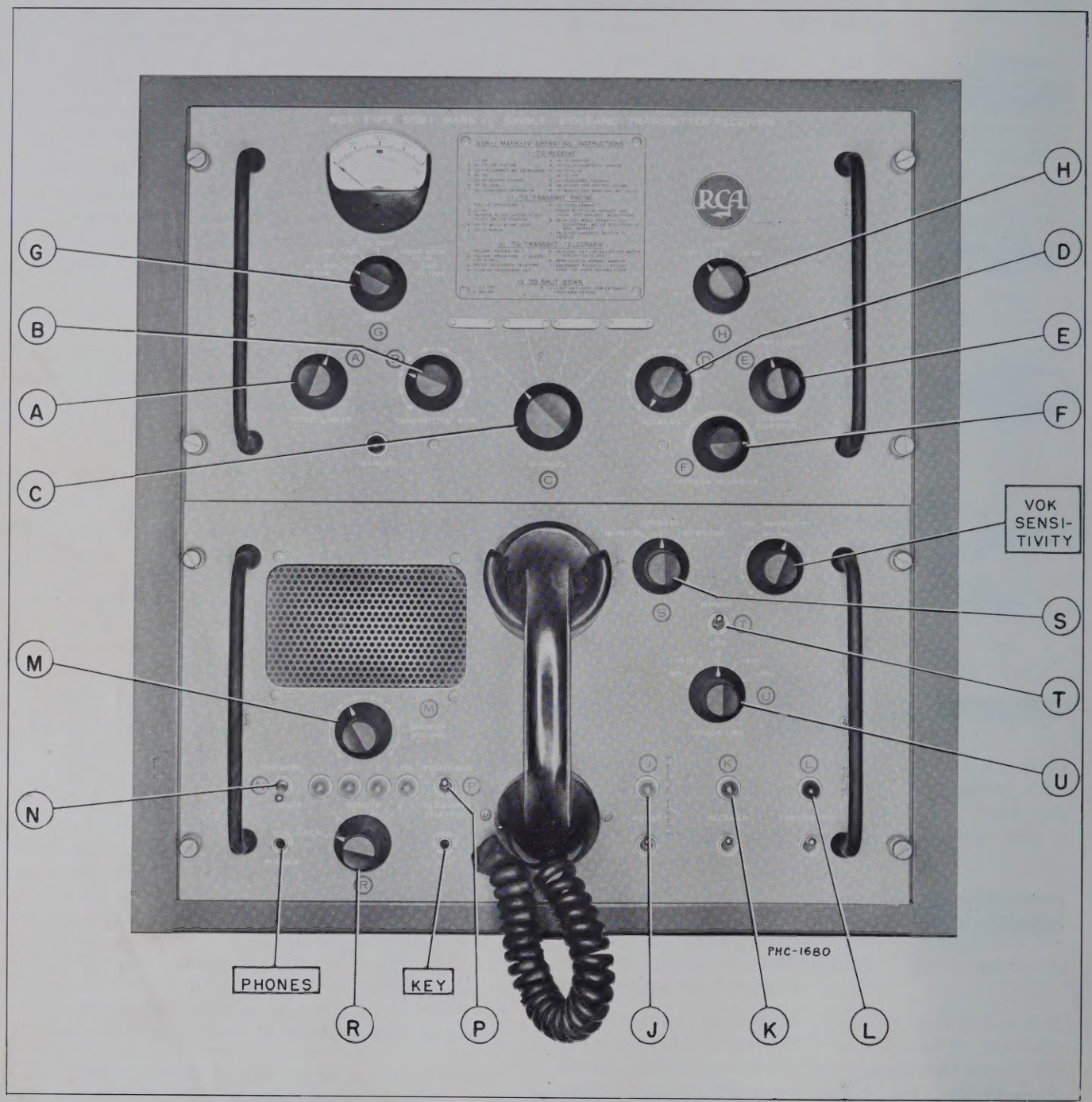


Fig. 45—Front Panel Operating Controls, SSB-1 Mark IV

Section V
OPERATION

GENERAL

All indicators and operating controls of the SSB-1 Mark IV are located on the front panels of the equipment. Controls and their associated indicators are keyed by the encircled letters to the step-by-step operating instruction chart at the top of the front panel.

The charts are supplied with the equipment in three languages, English, French and Spanish. The French and Spanish charts are shown on page 49.

Figure 45 shows the control and indicator locations. The table on page 48 lists and explains the function of the individual controls and indicators. The operator should become familiar with this information, and the proper sequence of operation, before attempting to operate the equipment.

Fundamental control of the SSB-1 Mark IV is performed by the local operator at the equipment location. The following functions must be performed by the local operator for any operation of the equipment.

1. Throw the POWER switch (J) upward to the "ON" position. The WHITE indicator lamp above the switch will light.
2. Turn the METER switch (G) to the "LINE VOLTAGE" position.
3. Turn the POWER LINE switch (U) to obtain a reading that falls within the wide black segment located directly above the world "line" marked on the meter. If the meter needle lies to the left of the LINE indicator segment (voltage too low), rotate the POWER LINE switch to the right (clockwise). Conversely, should the meter needle lie to the right of the LINE indicator segment (voltage too high), rotate the POWER LINE switch to the left (counter-clockwise).
4. Throw the RECEIVER switch (K) upward to the "on" position. The orange indicator lamp above switch will light.

   The equipment may now be used for receiving or for the INTERCOM function. When operation of the transmitter is desired the following step is also necessary.
5. Throw the TRANSMITTER switch (L) upward to the "ON" position. The RED indicator lamp above this switch will light.

The equipment may now be used to perform any of its functions by setting the proper controls for the desired function, as outlined in the following paragraphs.

PUSH-TO-TALK (SIMPLEX) OPERATION

Push-to-talk operation, commonly referred to as "SIMPLEX" operation, may be performed by the local operator or by an operator at any one of three remote locations where remote desk sets are installed. This permits any operator to communicate with another station merely by depressing the button on the handset handle and speaking into the microphone. To receive, the button is released. This automatically places the receiver in operation.

Simplex Operation is outlined in A, B and C below.

A. LOCAL SSB RADIO TELEPHONE OPERATION

Receiver Controls

1. General steps 1 to 5 explained above should be completed.
2. Turn CHANNEL switch (C) to the desired channel.
3. Turn LOCAL/REMOTE switch (R) to "LOCAL."
4. Select "SPEAKER" or "HANDSET" position with switch (N) , whichever is desired.
5. Turn switch (S) to "OPERATE" position.
6. Turn SQUELCH control (D) fully clockwise.
7. Turn AGC switch (H) to "SLOW."
8. Turn NOISE LIMITER switch (A) to "OFF."
9. Select the desired sideband with SIDEBAND SELECTOR switch (E)
10. Adjust SPEAKER/VOLUME control (M) for desired volume.
11. Adjust SPEECH CLARIFIER control (F) for most natural voice reproduction of received signals.
12. With SPEECH CLARIFIER (F) at mid position adjust C321, C322, C316, C317 (depending upon channel used) for clear, undistorted speech.

Transmitter Controls

1. Carrier switch S202 on top of receiver/transmitter chassis should be at the "OUT" position. To reach this switch raise the cabinet lid. The switch is located at the right-hand front corner of the chassis adjacent to the panel support bracket. The switch has a slotted shaft which should be turned with a screwdriver.
2. Turn METER switch (G) to "MODULATION LEVEL" position.
3. Throw MANUAL/VOK switch to "MANUAL" position.
4. Throw TELEPHONE-TELEGRAPH/TELETYPE switch (P) to the "TELEPHONE" position.

FUNCTIONS OF CONTROLS AND INDICATORS

TRANSMITTER-RECEIVER UNIT		
DESIGNATION	**TYPE OF CONTROL**	**FUNCTION**
A NOISE LIMITER	Rotary switch (2 positions)	"ON" position permits limiting of A-F Amplifier tube V223A by conduction of the diodes across R362 in grid circuit of the tube. "OFF" position removes the diodes from the circuit.
B TRANSMITTER GAIN	Potentiometer	Adjusts gain of transmitter.
C CHANNEL 1-2-3-4	Rotary switch (4 positions)	Selects predetermined operating frequency of transmitter and receiver. Frequencies are as marked on front panel plates.
D SQUELCH	Potentiometer	Quiets receiver during stand-by operation.
E SIDEBAND SELECTOR	Rotary switch (2 position)	Selects upper or lower sideband operation of receiver and transmitter.
F SPEECH CLARIFIER	Trimmer capacitor	Compensates for slight frequency differences between other SSB transmitters not having stable signal or speech clarifiers. Normally set for clear voice reproduction.
G METER	Rotary switch (5 position)	Permits front panel meter to be used in various functions.
H AGC	Rotary switch (3 position)	Selects FAST or SLOW AGC response or AGC "OFF".
POWER SUPPLY UNIT		
DESIGNATION	**TYPE OF CONTROL**	**FUNCTION**
J POWER	Neon lamp (white)	Lights to indicate application of AC to T106 and T107 in Power Supply when Power toggle switch is in "up" position. Indicates voltage applied to crystal ovens and K101 relay.
K RECEIVE	Neon lamp (orange)	Lights to indicate application of AC to T104 and T105 in Power Supply when RECEIVER toggle switch is in "up" position. Indicates B+ and filament voltage applied to receiver.
L TRANSMITTER	Neon lamp (red)	Lights to indicate application of AC to T101 and T102 when TRANSMITTER toggle switch is in "up" position. Indicates B+ and filament voltage applied to transmitter.
M SPEAKER VOLUME	Potentiometer	Sets the level of audio output from speaker or phones.
N SPEAKER/HANDSET	Toggle switch (2 positions)	Switches audio to speaker (head phones, if used) or local handset.
P TELEPHONE/ TELEGRAPH/TELETYPE	Toggle switch (2 positions)	Switches function of equipment to telephone operation or telegraph (including teleprinter operations).
R LOCAL/REMOTE	Rotary switch (5 positions)	Transfers control of operations to local, remote or line.
S MONITOR/OPERATE/ INTERCOM	Rotary switch (3 position)	Switches mode of operation to Monitor, Operate or Intercom.
T MANUAL/VOK	Toggle switch (2 position)	Selects Manual (push-to-talk) or VOK (Voice-operated relay) operation.
VOK SENSITIVITY	Potentiometer	When VOK is used, sets the audio level to control transmit/receive functions automatically by voice.
U POWER LINE	Rotary switch (5 position)	Selects taps on power transformer T106 to compensate for high or low line voltage.

MANEJO DEL EQUIPO SSB-1 MARK IV
I. RECEPCION
1. (J) ENCENDIDO
2. (G) POSICION "LINE VOLTAGE"
3. (U) POSICION QUE INDIQUE EN EL MEDIDOR LA TENSION CORRECTA
4. (K) ENCENDIDO
5. (C) EN EL CANAL DESEADO
6. (R) POSICION "LOCAL"
7. (N) POSICION "HANDSET" (MICROTELEFONO) O "SPEAKER" (ALTO-PARLANTE)
8. (S) POSICION "OPERATE"
9. (D) POSICION EXTREMA IZQUIERDA
10. (H) POSICION "SLOW"
11. (A) POSICION "OFF"
12. (E) SEGUN LA BANDA LATERAL DESEADA
13. (M) SEGUN EL VOLUMEN DESEADO
14. (F) POSICION DE MAXIMA CLARIDAD EN LA VOZ RECIBIDA
II. TRANSMISION TELEFONICA
1. EFECTUENSE LAS MANIOBRAS DE LA SECCION I
2. (L) ENCENDIDO
3. EL CONMUTADOR "CARIER IN-OUT" (S202 CHASIS SUPERIOR) EN LA POSICION "OUT"
4. (G) POSICION "MODULATION LEVEL"
5. (T) POSICION "MANUAL"
6. (P) POSICION "TELEPHONE"
7. OPRIMASE EL BOTON DEL MICROTELEFONO Y HABLESE ANTE EL MICROFONO
8. (B) MIENTRAS SE HABLA AJUSTESE DE MODO QUE LA AGUJA DEL MEDIDOR LLEGUE HASTA LA MARCA DE MODULACION
9. PARA RECIBIR LIBERESE EL BOTON DEL MICROTELEFONO
III. TRANSMISION TELEGRAFICA
1. EFECTUENSE LAS MANIOBRAS DE LA SECCION I
2. EFECTUENSE LAS MANIOBRAS DEL 1 AL 5 SECCION II
3. (P) POSICION "TELEGRAPH/TELETYPE"
4. CONECTESE EL MANIPULADOR EN EL "KEY"
5. (B) CIERRESE EL MANIPULADOR Y AJUSTESE DE MODO QUE EL MEDIDOR INDIQUE 200
6. TRANSMITASE NORMALMENTE
7. EL EQUIPO RETORNA A LAS CONDICIONES DE RECEPCION AL CESAR LA TRANSMISION
IV. APAGADO DEL EQUIPO
1. (L) APAGADO
2. (K) APAGADO
3. (J) ENCENDIDO, A MENOS QUE EL EQUIPO VAYA A QUEDAR EN REPOSO DURANTE HORAS O DIAS
PHA-1685

Fig. 46—Operating Instructions, Spanish Language

MODE D'EMPLOI DU SSB-1 MARK IV
I. RECEPTION
1. (J) ALLUMAGE (LAMPE TEMOIN)
2. (G) A POSITION "LINE VOLTAGE"
3. (U) POUR LECTURE CORRECTE DE L'INDICATEUR
4. (K) ALLUMAGE (LAMPE TEMOIN)
5. (C) AU CANAL DESIRE
6. (R) A POSITION "LOCAL"
7. (N) A POSITION "HANDSET" (COMBINE) OU "SPEAKER" (HAUT-PARLEUR)
8. (S) A POSITION "OPERATE"
9. (D) COMPLETEMENT A GAUCHE
10. (H) A POSITION "SLOW"
11. (A) A POSITION "OFF"
12. (E) A BANDE LATERALE DESIREE
13. (M) REGLAGE DU VOLUME DESIRE
14. (F) REGLAGE DE LA QUALITE VOCALE
II. EMISSION RADIOTELEPHONIQUE
SUIVEZ LA MANOEUVRE I
2. (L) ALLUMAGE (LAMPE TEMOIN)
3. COMMUTATEUR "CARRIER IN-OUT" (S202 SUR LE CHASSIS SUPERIEUR) SUR LA POSITION "OUT"
4. (G) A POSITION "MODULATION LEVEL"
5. (T) A POSITION "MANUAL"
6. (P) A POSITION "TELEPHONE"
7. POUSSEZ LE BOUTON DU COMBINE ET PARLEZ DANS SON MICRO
8. (B) LORSQUE VOUS PARLEZ, AJUSTEZ L'INDICATEUR JUSQU'A LA MARQUE DE MODULATION
9. POUR RECEVOIR, LACHEZ LE BOUTON DU COMBINE
III. EMISSION RADIOTELEGRAPHIQUE
1. SUIVEZ LA MANOEUVRE I
2. SUIVEZ LES OPERATIONS 1 A 5 DE LA MANOEUVRE II
3. (P) A POSITION "TELEGRAPH/TELETYPE"
4. ENFICHEZ DANS "KEY" LE MANIPULATEUR TELEGRAPHIQUE
5. (B) APPUYEZ SUR LE MANIPULATEUR ET AJUSTEZ L'INDICATEUR A LA MARQUE 200
6. EMETTRE EN CODE DE FACON NORMALE
7. L'APPAREIL REVIENT AU REGIME DE RECEPTION DES LA FIN DE L'EMISSION
IV. POUR ARRETER
1. (L) EXTINCTION (LAMPE TEMOIN)
2. (K) EXTINCTION (LAMPE TEMOIN)
3. (J) LAISSEZ ALLUME SAUF POUR UN ARRET DE PLUSIEURS HEURES OU PLUS
PHA-1684

Fig. 47—Operating Instructions, French Language

5. Press the P/T button on the local handset. The red "TRANSMIT" indicator lamp will light.
6. Speak into the handset microphone and while speaking at normal level adjust the TRANSMITTER GAIN control (B) for occassional meter deflection to "MOD" marker on highest voice peaks.
7. Release the P/T button to receive the answering signal.

B. LOCAL AM RADIO TELEPHONE OPERATION

Communication with an AM station on the same frequency as selected for the SSB-1 Mark IV, is achieved by inserting a carrier signal. This is required to allow detection of the signal by AM receivers. The SSB-1 receiver is capable of reception of either AM or SSB signals.

Receiver Controls

1-12. Same as steps 1 to 12 of paragraph "A" above.

Transmitter Controls

1. Carrier switch S202 on top of receiver/transmitter chassis must be thrown to "IN" position.

2-7. Same as steps 2 to 7 of paragraph "A" above.

C. REMOTE RADIO TELEPHONE OPERATION

Receiver Controls

1-12. Same as steps 1 to 12 of paragraph "A" above.

Transmitter Controls

1-6. Same as steps 1 to 6 of paragraph "A" above.

7. Throw LOCAL/REMOTE switch (R) to the remote position at which the equipment is to be controlled. White light on remote handset will light.
8. Lift remote handset from its cradle. The WHITE panel light, for the position selected in step 7, will light at the "local" position.
9. Depress the P/T button on the remote handset. The red TRANSMIT light on the remote handset will light. Also the red TRANSMIT light at the "local" position will light.
10. Speak into the remote handset to transmit. Release the P/T button to receive.

RADIO TELEGRAPH OPERATION

Operation of the SSB-1 Mark IV for telegraph communication is performed at the local location. Keying speeds up to 30 WPM may be employed.

Receiver Controls

1-4. Same as steps 1 to 4 of paragraph "A" above under "PUSH-TO-TALK OPERATION."

5. Turn switch (S) to "MONITOR" position.

6-10. Same as steps 6 to 10 of paragraph "A" above.

Transmitter Controls

1-3. Same as 1 to 3 of paragraph "A" above.

4. Throw TELEPHONE-TELEGRAPH/TELETYPE switch (P) to TELEGRAPH/TELETYPE position.
5. Insert telegraph key into "KEY" jack.
6. Depress key and adjust TRANSMITTER GAIN control (B) for meter deflection to the 200 mark on meter. The red TRANSMIT indicator will light when key is depressed.
7. Operate key in normal manner. The transmitter will remain "on" during continuous normal keying speeds (up to 60 words per minute) and will revert to receive on pauses in keying, Break-in operation can be used if desired. The speaker (or headphones) will reproduce a monitoring signal of what is being transmitted.

RADIO TELEPRINTER OPERATION

Teleprinter information may be transmitted and received by the SSB-1 Mark IV when teleprinter equipment is properly connected to the unit.

These connections are shown on page 85 under "Telegraphy and Teleprinters."

The following steps must be performed by the local operator to permit transmission and reception of such information.

Receiver Controls

1-10. Same as steps 1 to 10 of paragraph "A" for LOCAL RADIOPHONE OPERATION.

Transmitter Controls

1-3. Same as paragraph "A" above.

4. Throw the TELEPHONE-TELEGRAPH/TELETYPE switch (P) to TELEGRAPH/TELETYPE position.
5. Throwing the SEND/RECEIVE switch on the teletype equipment to "send" will transfer the SSB-1 equipment to transmit and the red TRANSMIT light on the equipment will light.
6. Operating the teleprinter machine keys the tone oscillator of the SSB-1 up to speeds of 60 WPM.
7. Throwing the teleprinter SEND/RECEIVE switch to RECEIVE automatically transfers the SSB-1 to receive and the incoming answering tone signals feed to the teleprinter equipment (through a tone converter) and operate the teleprinter receiver.

INTERCOM OPERATION

The INTERCOM function provides two way communication between the local operator and any of the remote locations or with any location connected to the equipment via the telephone line. The equipment is operated as outlined below when INTERCOM operation is desired. Steps 1 to 4 listed under GENERAL INSTRUCTIONS must be completed.

Calls Originated by the Local Operator

1. Turn switch (S) to the INTERCOM position.
2. Throw the SPEAKER/HANDSET switch to the HANDSET position.
3. Select the location, using the LOCAL/REMOTE switch (R) , with which communication is desired. This will light the WHITE light on the handset of the remote location selected.
4. Push the P/T button on the local handset. This will operate the buzzer at the remote location, signalling the remote operator.
5. When the remote location handset is removed from its cradle the white lamp at the local position will light for the location selected.
6. Normal telephone communication can be carried on between the local and remote locations. Except as indicated in step 4 (to signal the remote location), it is not necessary to use the P/T buttons for INTERCOM communication.

Calls Originating From a Remote Location

1. Remote location operator removes the handset from its cradle.
2. Remote location operator depresses pushbutton switch on handset. This operates the buzzer at the local position.

When a prearranged signal is used, i.e. 1 buzz for remote location #1, 2 for remote location #2 etc., the local operator knows which location is calling.

3. Local operator turns switch (R) to location signalling. Normal two-way telephone communication can now be carried on. The P/T buttons do not have to be depressed when speaking.

NOTE:—Where no prearranged signal is established, the local operator, by switching the LOCAL/REMOTE switch (R) to each position, will be aware of the location calling as the panel light for that location will come on when the switch reaches the correct position.

LINE INTERCOM

Intercom communications may be carried on between the SSB-1 Mark IV and any land-line telephone station provided the telephone line is connected, through a telephone hybrid, to the 600-ohm line terminals on the rear of the power supply unit of the SSB-1 Mark IV. Operation is the same as INTERCOM as described previously except that the LOCAL/REMOTE switch (R) should be placed in the LINE position and the P/T button on the local handset is not operative.

MONITORING

Switch (S) is turned to MONITOR for this function.

The monitoring function permits the local operator to monitor transmitted and received signals at the equipment location.

Monitoring is employed by the local operator during the following functions of the equipment.

1. To monitor telegraph keying originated by himself.
2. To monitor transmitted signals when a remote position is operating.
3. To monitor transmitted signals coming in on the telephone line.
4. Teleprinter transmissions may also be monitored, if desired, to indicate to the local operator that the equipment is functioning properly.

LINE RADIO TELEPHONE OPERATION

A signal fed to the SSB-1 Mark IV on the 600-ohm line input may be transmitted by the equipment, and the received answering signal fed back to the line.

The SSB-1 Mark IV requires an auxiliary VOK-10 relay unit to permit line telephone operation.

The equipment should be completely adjusted as outlined under PUSH-TO-TALK OPERATION covered in section "A" above. To switch to line operation requires the following steps.

1. Establish communication with the line location using the regular land line telephone as explained under INTERCOM OPERATION. Determine necessary information as to channel to be used, etc., and set SSB-1 controls accordingly.
2. Turn LOCAL/REMOTE switch (R) to "LINE" position.
3. Turn switch (S) to the MONITOR position.
4. Switch MANUAL/VOK switch (T) to the VOK position.
5. The incoming line signal will operate the VOK-10 relay and transfer the equipment to "transmit" as long as speech is maintained.

   When there is a pause in the signal the equipment will automatically transfer to the "receive" position and feed the received signal back to the line location.

Both the transmitted and received signals can be monitored by the speaker or headphones at the local operating position.

NOTE:—If the incoming line signal fails to energize the VOK-10 relay, and the monitored signal indicates proper line input level, the VOK SENSITIVITY control should be advanced until the line signal operates the VOK-10 relay, switching the equipment to "transmit."

TWO TONE FREQUENCY SHIFT TELEPRINTER OPERATION

Two tone frequency shift teleprinter operation with the SSB-1 Mark IV is accomplished by attachment of tone converter units between the teleprinter and the audio input and output circuits of the SSB-1 Mark IV.

The converters change the DC output pulses from the teleprinter into two audio tones, one representing the "MARK" signals and the other representing the "SPACE" signals. The two specific audio tones thus generated, when applied to the audio input circuits of the transmitter, are transmitted in the same manner as any other audio frequency signal. In reception, the audio frequencies are fed from the output circuits of the receiver into a converter which changes the received audio signals into the DC pulses required to operate the teleprinter.

Because only a very narrow frequency spectrum is required for such operation (for example, a typical teleprinter "CHANNEL" may be only 85 cycles wide, with the "MARK" frequency at 807.5 cps. and the "SPACE" frequency at 722.5 cps.) it is possible to mix (multiplex) several "CHANNELS", displaced slightly in frequency from each other, and transmit or receive numerous teleprinter messages simultaneously over one single sideband channel. This efficiently conserves spectrum space and substantially reduces receiving and transmitting equipment costs.

The number of teleprinter channels per single sideband frequency is limited by the audio passband of the transmitting and receiving equipment, the terminal equipment (converters and teleprinters) available, and the power available per channel.

When using two tone frequency shift terminal equipment with the SSB-1 Mark IV, the frequency shift tone receiver is connected between the 600-ohm line output (terminals 3, 4 and 5), TB104, and the receiving teleprinter. The frequency shift tone transmitter is connected between the 600-ohm line input (terminals 1 and 2) TB104, and the transmitting teleprinter. See page 85.

Operation of the SSB-1 Mark IV under these conditions is as described under PUSH-TO-TALK operation covered in Section "A". Audio output under this condition is controlled by the line level control, R368.

RADIO FREQUENCY PROPAGATION

Reliable radio communications over long distances depends on many factors. Two that are most important are the choice of frequency, and the choice of either day-time or night-time transmission. These are a prime consideration since propagation of energy at radio frequencies within the frequency range of the SSB-1 Mark IV Transmitter/Receiver will vary considerably, depending upon the variable position and composition of ionized layers of gases which exist between 30 and 250 miles above the earth.

These layers of gases (usually designated (D), (E), (F), F_2) are in a state of ionization for several reasons. Ionization of these gases is produced by electro-magnetic radiation (including ultraviolet light), X-rays, gamma rays and cosmic rays. Ions are also produced by the impact of high speed particles in molecules or atoms of a gas. The predominate cause of ionization in the upper atmosphere appears to be ultraviolet light from the sun.

Ionization is an important consideration in understanding radio propagation since, under certain conditions, ionized gases will either *attenuate, reflect,* or *pass* electromagnetic radio waves. For reliable communications it is necessary to transmit radio signals of the proper frequency and at the proper time of day so that these signals will be *reflected* by the ionosphere to the required receiving point.

To understand the reflection process, see figure 48. Radio waves being transmitted from point "A" leave the transmitter at angle 1. The transmitted wave fronts continue in a straight line upward from the transmitter until they reach the reflecting layer of ionized gas. It is a recognized phenomenon that electromagnetic radio energy moves faster through a gas, the greater the ionization of this gas. Refer again to figure 48.

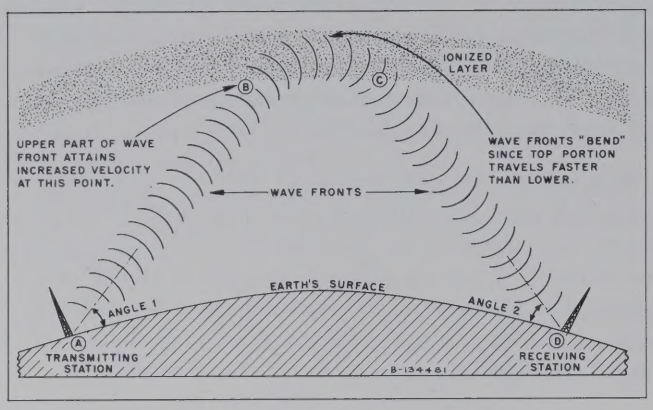


Fig. 48—Reflection of Radio Waves from a Layer of Ionized Gas

When the upper part of each wave front enters the ionosphere at point "B", it travels faster than the lower part. Since the upper part of the wave front is now traveling at an *increased* velocity and the lower part is traveling at its original speed (which is lower than the now increased velocity of the upper part of the wave front) the entire series of wave fronts wheel about similar to a column of soldiers obeying the command "Column Right!" The bending process continues until the new direction of the wave fronts causes them to pass from the ionosphere at point "C". The wave fronts then continue unobstructed in a straight line to point "D" and communication is established.

When the proper time of day is chosen and the proper frequency used, the reflection of radio signals in the manner just described gives maximum propagation of the transmitted signals.

NOTE: Refer to figure 48. This shows that both the height and the degree of ionization of the reflecting layer can cause the radio signal to be reflected at points other than the required point "D".

Figure 49 shows the relative positions of the four most common ionized layers during the daylight hours.

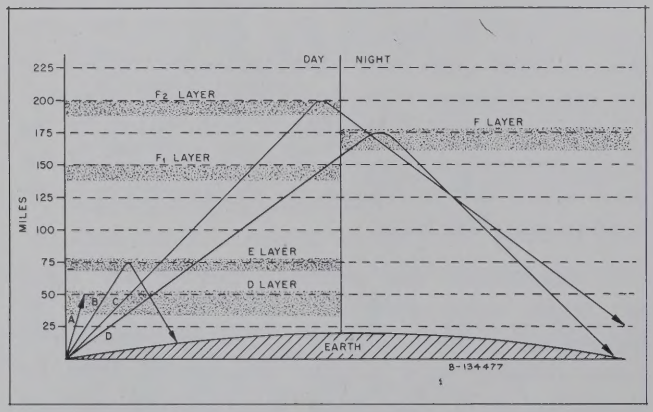


Fig. 49—Relative Positions of Ionized Layers

Notice that during the night-time hours the D and E layers disappear; and the F_1 and F_2 layers merge to form a signal reflecting ionized belt.

In addition to day and night changes there are other regular and irregular variations in the upper atmosphere, or ionosphere, which effect radio transmission. One of the foremost is the change caused by sunspot activity.

The exact nature of sunspots is not known but they are thought to be solar storms in the hot gases which make up the visible surface of the sun. Although sunspots themselves appear dark, they produce radiation having very high energy content. These outbursts of radiation reach the earth and cause striking changes in the ionization of the ionosphere.

During high sunspot activity, ionization of the F_1 and F_2 layers increases. Because of the greater ionization higher radio frequencies can be reflected by these layers and therefore may be utilized for long range communications. Maximum sunspot periods occur every eleven years, the most recent maximum period being 1958-1959.

A similar variation of ionization can also be expected as the relative position of the sun with respect to the earth moves from one hemisphere to the other. During the winter months ionization of F_2 layer is greatest; during the summer months ionization of the other layers is greatest. This means in winter there is less absorption of signals in the lower portion of the 3 to 15 mc band by the D layer and a greater reflection of the high frequencies by the F_2 layers.

Because of the many predictable and unpredictable characteristics and variations of the ionosphere its effect on radio signals of different frequencies varies greatly. This means the proper choice of operating frequencies is *extremely important* to reliable radio communications. The following general statements may be made concerning propagation in the 3 to 15 mc region, however for a more detailed analysis refer to the notes at the end of this discussion.

PROPAGATION IN THE 3 TO 4 MC REGION

These frequencies will be most useful for night rather than day-time communications. During the day the D layer tends to absorb frequencies in this range. After sundown, however, as the D layer disappears reliable communications may be obtained over distances of several hundred kilometers. During the summer months and particularly during the daylight hours, there are very high atmospheric noises present on these frequencies. This high noise level further reduces the effectiveness of these frequencies for daylight operation. This adverse noise condition is present all year in semi-tropical and tropical areas.

PROPAGATION IN THE 7 TO 8 MC REGION

Since these frequencies are subject to less absorption by the D layer they are more effective for daylight communications. After sundown they have characteristics similar to frequencies in the 3 to 4 mc band. Generally, summer noise is less of a problem in this band. Noise may be a problem however, in tropical zones.

PROPAGATION IN THE 12 TO 15 MC REGION

These frequencies are particularly useful during the daylight hours for communications over many hundreds of kilometers. During high sunspot activity these frequencies may be used to many advantages. After sundown the effectiveness of these frequencies is somewhat reduced.

NOTE: Though specific mention has been made only to limited bands of frequencies, these are the specific frequencies whose performance can be best described. Frequencies falling between the areas described may have characteristics of both the frequencies above and below. For example, 5 mc might under some conditions be useful for daytime transmission but would certainly be better at night. 6 mc would exhibit better daytime characteristics but would also improve at night, etc.

The above discussion of the capabilities of different frequencies is necessarily brief. A further and more complete study of the problems involved is recommended for anyone operating a communications system. The Central Radio Propagation Laboratory of the National Bureau of Standards, Washington, D. C., U.S.A., publishes charts which predict ionospheric conditions 3 months in advance. With these charts and by following instructions contained in U. S. Department of Commerce, National Bureau of Standards Circular 462, "Ionospheric Radio Propagation", it is possible to choose with considerable accuracy the best operating frequency for a given time, path length, and geographical location. The prediction charts are in the form of a publication called "GRPL-D Basic Radio Propagation Predictions".

This publication is available on a subscription basis from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., U.S.A. The annual subscription rate for persons residing outside the continental U. S. is $1.25 in U. S. currency. Copies of Circular 462 may also be obtained from that office at $1.25 each, U. S. currency.

Fading

One additional, relatively uncontrollable factor, will effect reliable communications. This is the phenomenon known as "FADING". The term fading refers to rapid changes in the strength of received radio signals which vary with time because of fluctuations in the ionosphere. Fading may take place with a duration of minutes, seconds, or even fractions of a second. In general, fading is more rapid on high frequencies than on low frequencies. There are many types of fading but only three need be considered in this discussion; Selective Fading, Absorption Fading, and Skip Fading.

SELECTIVE FADING

Selective Fading may be caused by many factors, however only its effect is important. In selective fading, some frequencies fade, while others are propagated. In conventional AM transmission, it is quite common to experience fading of either of the sidebands or the carrier, or both the carrier and one sideband simultaneously. Such fading in addition to causing variations in received signal intensity can create distortion of AM radio telephone signals. This type of fading is minimized by the RCA SSB-1 Mark IV since only one sideband is transmitted at any given time and the carrier is suppressed.

ABSORPTION FADING

As the name implies, absorption fading is caused by variations in the amount of energy absorbed from the radio wave by the ionosphere. This type of fading is in general much longer than selective fading since ionospheric absorption changes very slowly. There is a similar type of fading which might be referred to as Absorption Fading which is caused by absorption of radio signals by physical objects rather than the ionosphere.

This type of fading may be caused in a mobile receiver when the vehicle passes under a bridge or near a metal structure. In this case the signal is absorbed by the nearby structure. When there are nearby objects such as wires, fences, bridges, oil tanks, steel buildings, etc., which can cause these effects, extreme care must be exercised in selecting a proper location for a receiving antenna.

SKIP FADING

Skip fading is caused by reflected radio waves alternately skipping and returning to earth. Near sunrise and sunset, when the ionization is changing, the frequencies in use may be rapidly reflected to different points on the surface of the earth. When the ionosphere changes to a point that the reflected signals move out past the receiving station (called "going into skip"), the intensity of the received signals at the receiving station may drop by a factor of 100 or more and momentarily increase again just as abruptly. This type of fading may take place many times before steady transmission is established. It is a good indication that propagation conditions are changing and either the day-time or night-time frequency should be established.

All fading is minimized in the SSB-1 Mark IV through the use of automatic gain control in the receiver. This circuit automatically increases the gain of the receiver when the received signal decreases in intensity. Conversely, it lowers the gain of the receiver when the intensity of the received signal increases. This tends to keep audio output constant during such periods.

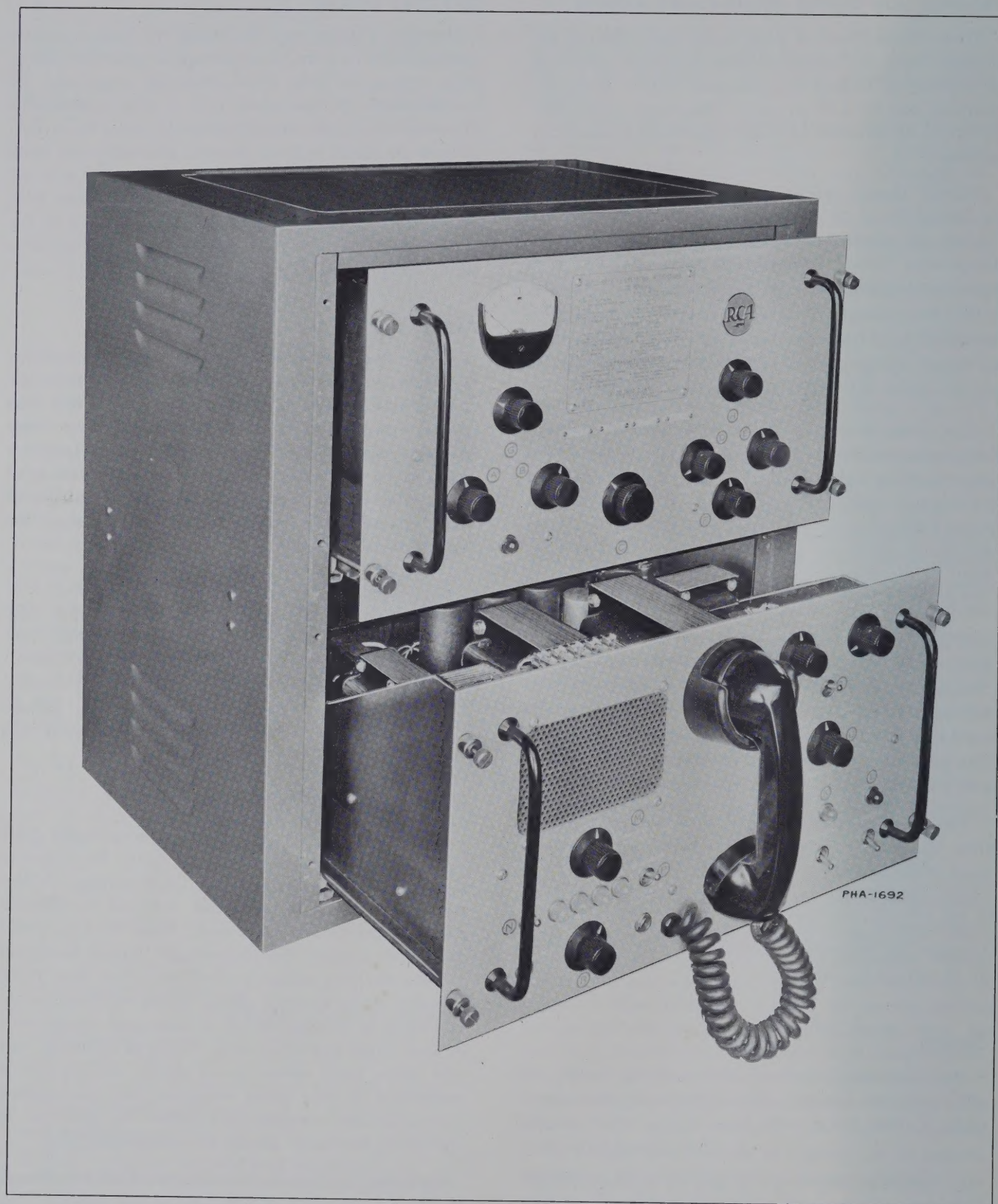


Fig. 50—Front View, SSB-1 Mark IV, showing Upper and Lower Chassis partially withdrawn

Section VI
MAINTENANCE

GENERAL.

The SSB-1 Mk. IV receiver should maintain correct alignment for a reasonably long period of time. Readjustment of tuned transformers and coils is not normally necessary unless they have been misaligned. Refer to the alignment procedure when alignment becomes necessary.

The only necessary routine maintenance is a periodic cleaning of the chassis and an inspection of the connections to the terminal boards on the rear of the chassis. All connections should be kept clean and tight. Arrange all wires and cables in an orderly manner to prevent the possibility of arc-over or shorts. Replace any wires that show signs of cracking or deterioration.

KNOB REMOVAL

The knobs on the front panel may be removed, when necessary, by loosening the set screws on the sides of the knobs. Use a #8 Allen set-screw wrench. There are two set screws on each knob except the CHANNEL knob which has only one.

TROUBLE SHOOTING

80% of all breakdown or faulty operation of radio communication equipment may usually be attributed to defective vacuum tubes. Since a defect in a tube is very often a filament "burn-out", visual inspection is advisable before servicing. A reliable tube tester may be required when checking for weak tubes. However, the substitution of tubes with good tubes is a faster method for finding defective tubes and restoring operation quickly.

Test equipment for troubleshooting need not be extensive. A vacuum tube voltmeter (with R-F probe), a signal generator with audio modulation, and an oscilloscope will serve for all servicing. Equipment for alignment purposes is listed under CHECKING AND ALIGNMENT.

One of the first steps in troubleshooting is to make a careful visual inspection of all components under the chassis. Look for signs of burning or overheating of components. Also check for loose connections and poorly soldered joints.

If there is no physical evidence to indicate the location of the failure, and it is evident that the power supply is supplying B-plus and filament voltages, the next step is to isolate the trouble.

When attempting to locate a trouble, a check of the voltages and resistances at the terminal boards will often indicate the faulty circuit immediately. Typical terminal board voltages and resistances are shown on page 72.

Signal tracing is the best method for quickly isolating trouble in a receiver. To do this, inject an audio signal at the grid of the audio amplifier tubes. If the audio signal can be heard from the speaker, the audio circuits are functioning. In a similar manner, a modulated R-F signal may be applied to various points in the R-F amplifier and detector circuits. After determining which circuit is causing the loss of signal, a voltmeter will generally indicate the defective component.

As a further aid in troubleshooting, beginning on page 61, simplified schematic diagrams and complete operation descriptions are given for five primary operating functions of the SSB-1 Mark IV. These functions are: RADIOTELEPHONE RECEIVE, RADIOTELEPHONE TRANSMIT, ON-OFF TELEGRAPH/TELEPRINTER, INTERCOM, MONITOR.

If trouble occurs in any of these operating positions reference should be made to the section under that heading. The function of each control, relay, indicator or other pertinent component is described and the sequence of operation is given. The simplified schematic diagrams for each function permit quick circuit checking without becoming confused with components used only in circuits not affected by the trouble.

Voltages and resistance charts for measurements at tube sockets are shown on pages 70 and 71. Measurements are given using both the RCA WV-98A Senior "VoltOhmyst" (VTVM) and the Simpson model 260 voltohmmeter. Measurements in high-frequency communications equipment should always be made with a high impedance meter. Low impedance instruments tend to "load down" high-frequency circuits and may give erroneous indications which can cause improper operation and subsequent damage to the equipment.

All adjustments and all tubes are accessible by merely loosening the four thumb-bolts at the corners of each of the two units, grasping the handles and gently pulling the units forward. Care should be taken when withdrawing the units to make sure that all cable and wire connections to the terminal boards at the rear of the chassis have sufficient slack so that excessive strain or unwanted disconnections do not occur.

CHASSIS REMOVAL

Both chassis of the SSB-1 Mk. IV equipment may be completely removed from the cabinet when necessary.

To accomplish this, first remove all wires and cables from the rear of the chassis to be removed. Next, loosen the large thumb screw near each corner of the front panel sufficiently to release the chassis from the cabinet. See figure 50.

Pull the chassis out on its rollers as far as it will go.

Place hands under each side of the chassis at the front. Lift up the front part of the chassis as far as possible, then pull the chassis up and out causing the chassis rollers to roll up and over the stops on the chassis slide.

CHECKING AND ALIGNMENT

The following procedures describe the tuning and adjustment of all circuits of the SSB-1 Mark IV. Normally, complete realignment of the SSB-1 Mark IV is not necessary. If a defective part, such as an IF transformer, is replaced, only that part of the circuit affected by the replacement need be realigned.

TEST EQUIPMENT

Equipment required to service and maintain the SSB-1 Mark IV need not be extensive. Equipment required to perform all necessary tests and checks includes:

1. Vacuum-tube voltmeter (RCA Senior "Volt-Ohmyst", WV-98A, or equivalent).
2. Calibrated R-F signal generator (RCA WR-49B, or equivalent).
3. Oscilloscope (RCA WO-91A, or equivalent).
4. Dummy antenna (Refer to "INSTALLATION, TRANSMITTER TUNING).
5. R-F Ammeter 0 - 3 Amp.

Typical instruments and specifications are shown on page 73.

POWER SUPPLY TESTS

The following specifications for the power supply are given here as an aid to servicing of the unit.

Receiver B-plus Voltage—terminal 5 of TB101:
210 volts DC; Limits: 210 to 220 V. DC; Load: 150 MA.

Receiver Regulated Voltage—terminal 13 of TB101:
150 volts DC for ±10% of AC line voltage variation; Limits: 145 to 152 V. DC; Load: 30 MA.

Receiver B− Voltage—terminal 6 of TB101:
−130 volts DC; Limits: −125 to −135 V. DC; Load: 50 MA.

Receiver Bias Voltage—terminal 8 of TB101:
Adjustable 0.75 volts DC; Limits: −72 to −78 V. DC.

Receiver Filament Voltage—terminals 11 and 12 of TB-101:
6.5 volts AC; Limits: 6.0 to 6.6 V. DC; Load: 4.1 amps.

Transmitter High Voltage—terminal J104:
70 MA load: 773 volts DC; Limits: 760 to 820 V. DC.
250 MA load: 732 volts DC; Limits: 725 to 750 V. DC.
Ripple voltage measured with VTVM: 4.1 V. Limits: 4.5 v. max.

Transmitter Filament Voltage—terminals 2 and 3 of TB-101:
6.5 volts AC; Limits: 6.0 to 6.6 V. AC; Load: 6.5 amps.

AUDIO TESTS

The following tests can be made to determine the performance of audio circuits.

Loudspeaker Output

Connect an Audio Signal Generator to TB101-9. Adjust for 1000 cps., 4.4 volts rms. Tone should be audible at loudspeaker. Connect VTVM to J103 with phone plug. Adjust Audio Generator for 0.7 volt output on VTVM with SPEAKER VOLUME control at maximum. Voltage at J105 pin 2, TP101 and TB104-8 (audio output) should also be 0.7 volts. Limits: 0.63 to 0.77 V. rms.

600 Ohm Line Output

Connect a 220,000 ohm resistor from terminal TB101-10 to ground. Connect Audio Generator to TB101-10 adjusted for 1000 cps, 6.25 volts. Voltage at TB104-3, 5, (LINE OUT) should measure 5.0 volts rms. with 600 ohm resistor across terminals 3 and 5 of TB104. Limits: 4.5 to 5.5 V. rms.

Line Input, Amplifier and Speech Clipper

Connect Audio Generator to terminals 1 and 2 of TB104 (Line Input). Set LOCAL REMOTE switch to LINE and function switch S108 to OPERATE. Connect VTVM to TB101-1.

Input voltage at 1000 cps: .1 V.; Output: 6.0 V. rms.; Limits: 4.0 V. rms. minimum.

Input voltage at 1000 cps: 1.6 V.; Output: 26.0 V. rms.; Limits: 20 V. rms. minimum.

Handset Test

Set appropriate switches to OPERATE, LOCAL and MANUAL. Push-to-talk switch on handset should actuate relay K102. An indication of audio should be present at TB101-1 when the handset microphone is spoken into.

KEYING TEST

With a shorted test plug inserted into J101, a 1000 cycle tone should be present at TB101-1 with voltage of 6 to 12 V. rms. Relay K101 should be actuated.

REMOTE DESKSET TEST

Set switches to OPERATE and REMOTE. Push-to-talk switch should actuate K102 and audio should be present at TB101-1.

MONITOR TEST

Set function switch S108 to MONITOR and LOCAL-REMOTE switch to REMOTE. When remote handset is spoken into, output should be heard on loudspeaker.

INTERCOM TEST

Set function switch to INTERCOM and LOCAL-REMOTE switch to REMOTE. Buzzers at both locations should operate. Communication between remote handset and local handset should be possible.

TONE OSCILLATOR TEST

Short terminal 6 of TB104 (Tx Key) to ground. 1000 cycle tone should be present at TB101-1.

CHANGEOVER RELAY TEST

Short terminal 7 of TB104 (Tx Rec.) to ground. Transfer relay in Transmitter-Receiver should operate.

OSCILLATORS

The performance of an oscillator may be evaluated by the generation of a negative voltage at the grid of the oscillator tube. If a negative voltage is not present at the grid, it can usually be assumed the circuit is not oscillating. In this event, the crystal should be checked by substituting a crystal known to be operative.

CAUTION

TO PREVENT LOADING OF THE OSCILLATOR CIRCUITS WHEN CHECKING TUBE GRID FOR PROPER OPERATION USE ONLY A HIGH IMPEDANCE PROBE. THE USE OF LOW IMPEDANCE INSTRUMENTS WILL GIVE INCORRECT INDICATIONS OF OSCILLATOR ACTIVITY AND IN SOME CASES MAY CAUSE THE OSCILLATOR TO STOP OSCILLATING.

1. Turn on the POWER and RECEIVER switches and permit the equipment a 15 minute warm-up period.
2. Insert the high-impedance probe of a VTVM in TP-203. A nominal reading of 9 volts should be obtained for the 250 kc oscillator output.
3. Insert the probe in TP-202. A nominal reading of 9 volts should be obtained for the 1150-1650 kc oscillator output. Adjust C343 (1650 kc), C344 (1150 kc) for maximum output.
4. Insert the probe in TP-201. A nominal reading of 0.35 volts should be obtained for the R-F channel oscillator output for all four positions of the CHANNEL selector.
5. Using an accurate frequency standard, which is tuned to 250 kc, set the 250 kc oscillator exactly on frequency by adjusting trimmer capacitor C346. Also check the 1150-1650 kc oscillator with the frequency standard set at each frequency. SPEECH CLARIFIER control C341 is the trimmer across the output. Zero beat with the standard should occur near the center of the SPEECH CLARIFIER range.

TRANSMITTER

All components mentioned in the following procedures may be located by referring to figure 41 and the illustrations beginning on page 74.

WARNING

HIGH VOLTAGES ARE PRESENT IN THIS EQUIPMENT. EXERCISE CAUTION WHEN PERFORMING THE ALIGNMENT PROCEDURES. BEFORE APPLYING POWER, MAKE CERTAIN THAT THE EQUIPMENT HAS BEEN GROUNDED.

1. Set TRANSMITTER GAIN to extreme counterclockwise position, CARRIER switch to OUT, TELEGRAPH-PHONE switch to TELEGRAPH and CHANNEL selector to position 1. Attach dummy antenna as described on page 41, throw on the POWER, RECEIVER and TRANSMITTER switches.
2. Depress telegraph key. Set power supply bias control R136 for a reading of 35 on the meter.
3. Connect the high-impedance probe of a VTVM from TP201 to ground. Set TRANSMITTER GAIN control to mid position. With key depressed adjust both primary and secondary of T-201 for maximum deflection of the VTVM.
4. Turn off the POWER switch.
5. From a fully counterclockwise position, rotate IPA PLATE TANK COIL SLUG 1 (L215) the number of turns required to tune to the desired output frequency of channel 1. The number of required turns relative to the desired frequency is shown in the chart figure 43, page 43.
6. Place tap 1 of PA TUNING COIL (L202) at the number of turns from the cold end (end closest to ANTENNA TUNING COIL) required to tune to the desired output frequency of channel 1. The required number of turns relative to the desired frequency is shown in figure 42, page 42.
7. Adjust the associated components for channels 2, 3 and 4 by repeating the procedures of (5) and (6), above.
8. Set coupling capacitors C201, C202, C203 and C204 for maximum capacitance (fully counterclockwise).
9. Set taps 1, 2, 3 and 4 of antenna tuning coil L201 on the turn closest to the antenna terminal post.
10. Connect an audio oscillator (600 ohm output impedance) across terminals 1 and 2 of TB104 and inject a 1000 cps signal at a level of approximately 1 volt.

    Note: If an audio oscillator is not available, the tone oscillator in the SSB-1 Mark IV may be used.

11. Remove key from the KEY jack, set TELEGRAPH-PHONE switch to PHONE. Disconnect dummy antenna. Tape the mike button closed.

12. Turn on the POWER, RECEIVER and TRANSMITTER switches. Place meter switch in PA TUNE position.

    Note: For the remainder of this procedure, make certain that the meter does not indicate more than half-scale in the PA TUNE position with the antenna disconnected. Decrease reading as necessary by lowering the TRANSMITTER GAIN setting.

13. Set CHANNEL selector to position 1. Raise the TRANSMITTER GAIN control setting and adjust 3rd BAL. MOD. PLATE TUNING CAPACITOR 1 (C232) for maximum deflection of the meter. To be sure of tuning to the desired output frequency and not the oscillator frequency, lower the setting of the TRANSMITTER GAIN control. If the reading decreases, the mixer is tuned to the desired frequency. Retune the primary and secondary of T201 for maximum deflection of the meter.

14. Adjust the IPA plate tuning coil slug No. 1 for maximum deflection on the meter.

15. Adjust plate tank tuning capacitor No. 1 (C208) for a dip in the meter reading.

16. Turn TRANSMITTER switch off and reconnect dummy antenna.

17. Adjust carrier level capacitor (C243) for half capacitance and turn TRANSMITTER GAIN control to zero.

18. Turn TRANSMITTER switch on and CARRIER switch to IN. Note meter reading.

19. Throw CARRIER switch to OUT and change tap No. 1 of L201 one turn at a time. At each turn, put CARRIER switch on and note meter reading. Repeat this procedure until a peak reading is obtained. This is the correct tap setting for L201. Readjust PA PLATE TUNING CAP 1 (C208) for a dip in meter reading. Only a slight variation of the capacitor should be required if the antenna circuit has been properly resonated.

    Note: If unable to note any rise in the meter reading as the antenna coil tap is changed, increase coupling to the antenna circuit by rotating ANTENNA COUPLING CAP 1 (C201) clockwise one or two turns, retune PA PLATE TUNING CAP 1 (C208) for a dip in the meter reading and repeat procedure in this paragraph.

20. Set CARRIER switch to OUT and raise the TRANSMITTER GAIN control setting. Full load conditions are obtained when the meter indicates a reading of 200 in the MOD. LEVEL position coincident with a reading of 120 in the PA TUNE position.

21. If the meter reads 200 in the MOD LEVEL position coincident with a reading *below* 120 in the PA TUNE position, turn capacitor C201 clockwise in small increments, dipping the PA TUNE indicator with C208 after each change. Raise the TRANSMITTER GAIN setting after each change until full load conditions exist.

22. If the meter reads 200 in the MOD LEVEL position coincident with a reading *in excess* of 120 in the PA TUNE position turn capacitor C201 counter-clockwise, dipping the meter reading with C208, until full load conditions exist.

23. Align channels 2, 3 and 4 by repeating steps 13 through 22 above, using the proper PA tuning and coupling capacitors for each channel.

24. The TRANSMITTER GAIN control, with a 1 volt audio input, should be at its approximate mid-position for full load conditions on all channels.

PA NEUTRALIZATION

The setting of the PA neutralizing capacitor C220 will very seldom require adjustment. Need for re-neutralization will be apparent if excessive plate dissipation in the PA tubes is noted with full output (plate slightly red) or if an oscillatory condition exists, usually at the higher frequencies.

If neutralization adjustment is required, connect a 0-3 amp (or lower) RF ammeter in series with the dummy antenna. With transmitter controls set as for channel alignment and the CHANNEL switch set for channel 4, advance the TRANSMITTER GAIN control for approximately ¼ scale reading in the PA TUNE position and vary the plate tuning capacitor C205 through resonance as indicated by the dip in the meter reading. Also note the reading of the RF ammeter. The dip in the meter reading should coincide with maximum current as indicated on the RF ammeter when the PA is properly neutralized. If this is not the case vary the setting of neutralizing capacitor C220 in small increments until the dip in the meter reading and maximum output current are coincident. Tighten the locking nuts on C220 and recheck neutralization.

CARRIER BALANCE

Closely couple a suitable oscilloscope to the dummy antenna with CHANNEL switch set on channel No. 1. Set the TRANSMITTER GAIN to its mid-position. With no audio input, adjust 250 kc balance (C256 and R242) and 1150 kc balance (C239 and R224) for minimum output on the oscilloscope. This adjustment is critical and should be done in steps because of interaction between the controls. Adjust the 250 kc balance first and the 1150 kc balance second.

CARRIER LEVEL ADJUSTMENT

Lock the telegraph key in a "key down" position or insert a shorted phone plug in the key jack.

Set the TRANSMITTER GAIN control for a full output on the channel with the lowest response. (This is the channel where the TRANSMITTER GAIN control must be most advanced for full output.)

Closely couple an oscilloscope to a dummy antenna connected to J201.

Set the level on the oscilloscope for 20 divisions at full RF output.

Set the TRANSMITTER GAIN control at minimum.

Set the CARRIER switch to IN and adjust capacitor C243 for 10 divisions on the oscilloscope.

Set meter switch to MODULATION LEVEL.

Increase the TRANSMITTER GAIN control until the meter reading indicates 125 (MOD. line).

The pattern on the oscilloscope should appear as a two-tone signal with a sharp cross-over point as shown in figure 51.

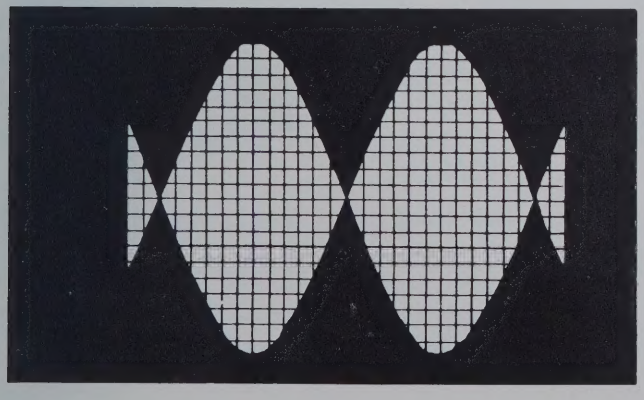


Fig. 51—Two-tone Test, Oscilloscope Presentation

RECEIVER CHANNEL ALIGNMENT

Perform receiver channel alignment in accordance with procedure given under "RECEIVER TUNING PROCEDURE", page 44.

RECEIVER ALIGNMENT — 1400 KC IF

Connect R-F signal generator to TP204. Use a 1401 kc signal.

Adjust top and bottom cores of T203 for maximum AVC volts on the VTVM.

RECEIVER ALIGNMENT — 250 KC IF

Turn POWER and RECEIVER switches "on".

Set RECEIVER GAIN control fully clockwise.

Connect a VTVM at TP101 on the power supply chassis. Use AC scale on VTVM.

Connect an R-F signal generator to TP205. Use a 251 kc unmodulated signal.

Adjust top and bottom cores of T204, T206 and T207 for maximum AVC volts on the VTVM.

MECHANICAL FILTER RESPONSE

Connect the test equipment as in RECEIVER ALIGNMENT. Adjust the output of the generator and the vertical amplitude of the oscilloscope to produce a response 20 divisions high.

Vary the frequency of the Generator between 250 kc and 254 kc. Do not vary the output of the generator.

Note the amplitude of the response on the oscilloscope with small variations in frequency. Plot the amplitude of the response versus the frequency on linear graph paper. Use several frequency settings to obtain several plots and then draw the response curve. Compare with figure 52. If necessary, adjust C245, C248, T206, T204 and T207 for optimum bandpass and symmetry.

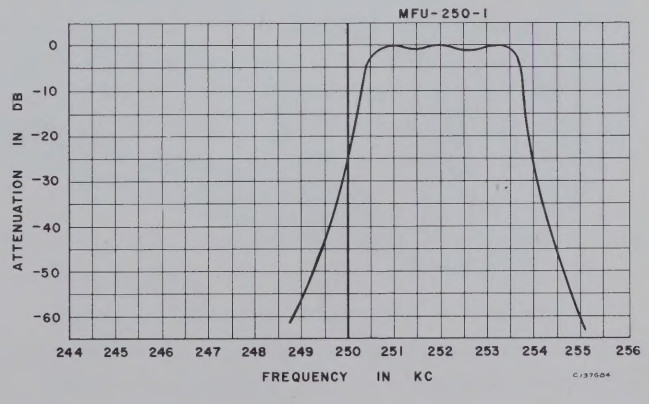


Fig. 52—Mechanical Filter Response Curve

ROUTINE MAINTENANCE

The SSB-1 Mk. IV can be maintained at peak performance without the need of frequent service by keeping the equipment clean and free of dust and maintaining adequate inspection schedules. The frequency of these schedules will be determined by the conditions under which the equipment must function. Routine maintenance records should be kept on prepared forms so that a continuous record of performance may be had for reference. Records may then be compared and an evaluation made of the performance of the equipment.

A typical routine maintenance schedule is suggested below. The frequency of performance of maintenance procedures will vary according to operating conditions; for example, cleaning may be required more frequently in extremely dusty locations.

Routine Maintenance Schedule

Daily

Make general inspection.
See that all tube and tube shields are firmly seated.
Replace burned-out tubes and lamps.

Weekly

Remove all dust and dirt from the equipment.
Check all cables and leads for secure connections and correct lead dress.

Monthly

Make performance checks.
Clean all relay contacts.
Test tubes; replace weak tubes.

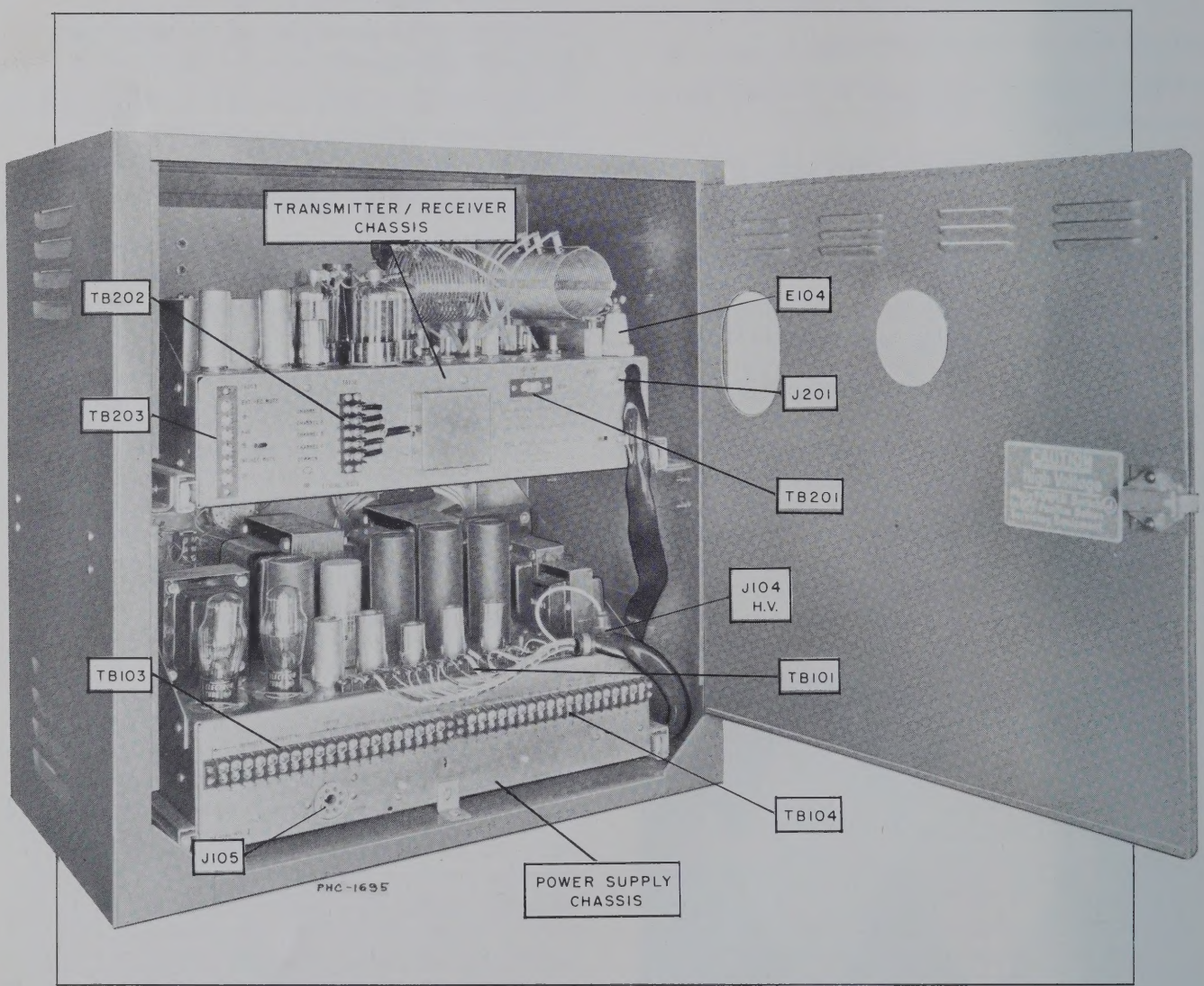


Fig. 53—Rear View, SSB-1 Mark IV, rear door open to show location of terminal boards

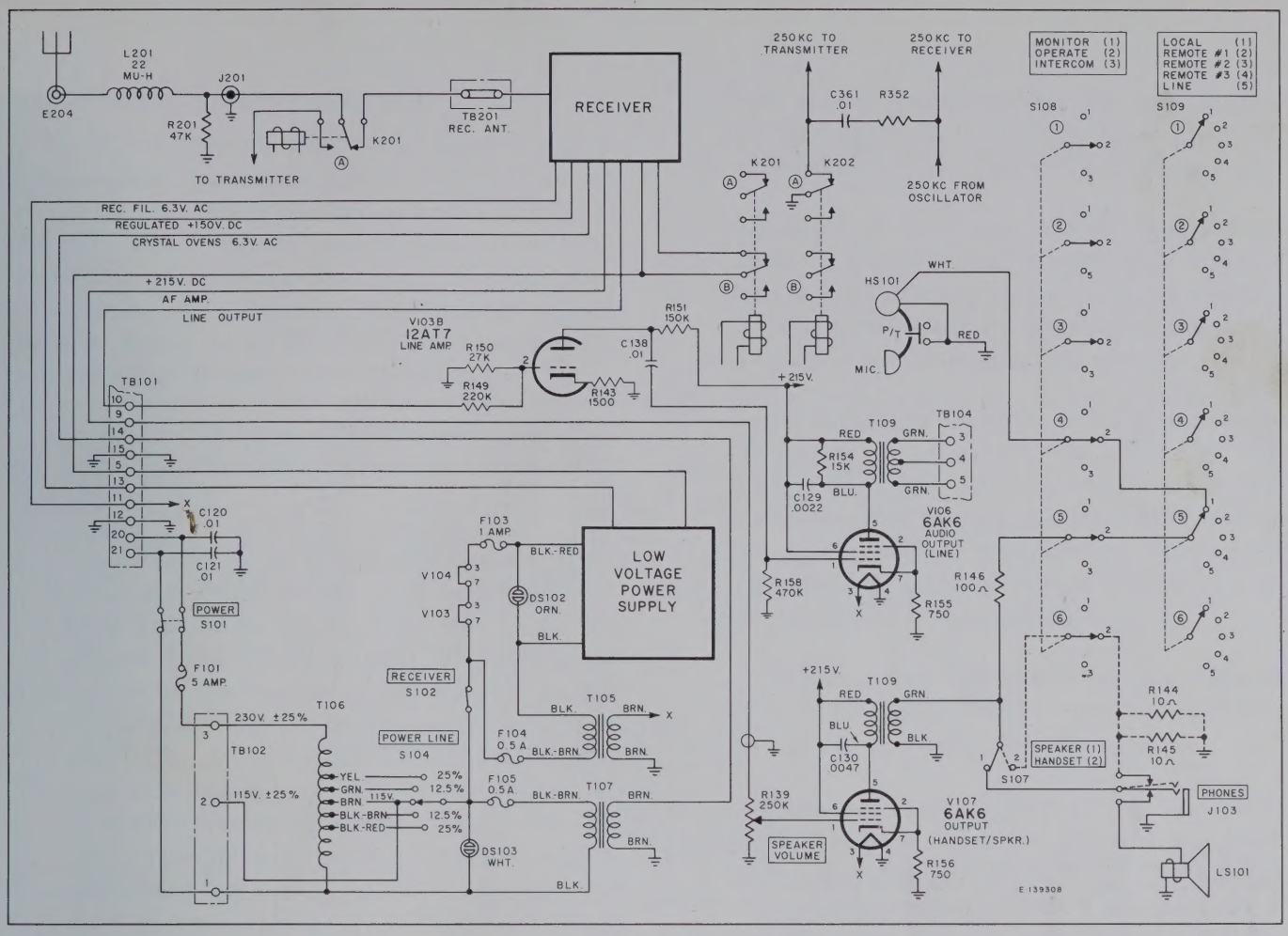


Fig. 54—Simplified Diagram, Radiophone Receive Function

RADIOPHONE RECEIVE FUNCTION

The RADIOPHONE/RECEIVE function permits listening to signals being received by the SSB-1 Mk. IV receiver at the local position, any of the three remote positions or, a location connected to the SSB-1 Mk. IV by a 600-ohm line.

The circuitry involved for listening at the local location, is shown in the above diagram, figure 54. These circuits are located in the power unit.

(a) When switch S101 is turned on, panel light DS103 (WHT.) lights and 6.3V AC is applied to the crystal ovens by transformer T107. Turned on, S102 lights panel light DS102 (ORN.) and supplies 6.3V AC filament voltage to the receiver from T105. It also activates the low voltage power supply. The low voltage supply feeds +215V DC to the receiver and supplies +150V regulated DC to crystal oscillator V209.

(b) The transmit/receive relays K201 and K202 are deenergized in the receive position. The "A" contacts of K201 connect the antenna to the receiver input. The "B" contacts of K201 apply +215V DC to the receiver. The "A" contacts of K202 ground the 250 kc oscillator signal fed to the transmitter. This prevents any signal from being transmitted.

(c) Switch S108 must be in the "operate" position for the local operator to receive incoming signals on the local handset HS101. S108 may be in *any* position when the received signal is to be reproduced by the speaker LS101.

The speaker/handset switch S107 should be in the HANDSET position for reception by the local handset.

Switch S109 must be in the LOCAL position for reception by the local handset.

(d) The audio signal from the receiver is fed to V107 audio output tube through the volume control R139. R139 controls the audio level at the handset, speaker or headphones. The audio output from T109 feeds to the local handset through section 5 of switch S108, and section 5 of switch S109 to the receiver of the local handset.

The output of T109 also feeds to speaker/handset switch S107. In position #1 this switch applies the signal either to the speaker or headphones. In position #2 it applies the signal to both the headphones and handset. This is indicated by the dotted lines.

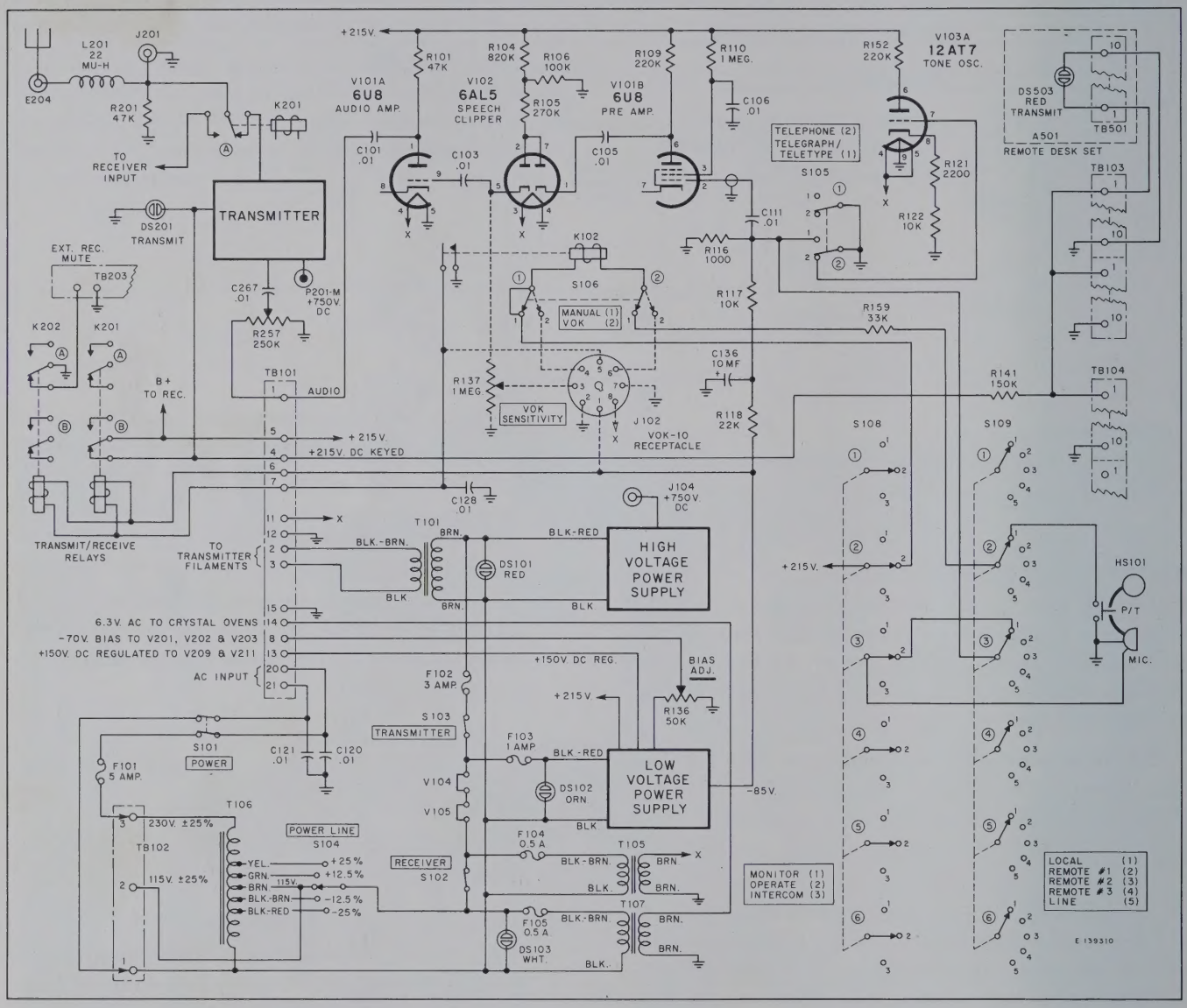


Fig. 55—Simplified Diagram, Radiophone Transmit Function

RADIOPHONE TRANSMIT FUNCTION

The RADIOPHONE/TRANSMIT function permits radiotelephone transmission from the local position, any one of the three remote positions or from signals fed to the SSB-1 Mk. IV the 600 ohm line input. The RADIOPHONE function may also be employed for transmission of two-tone audio frequency shift telegraph signals. Refer to Section V—OPERATION for information on two-tone audio frequency shift transmission.

The diagram, figure 55, shows the circuitry involved for radiotelephone transmission from the local operating position.

(a) Power switch S101 in the ON position lights panel light DS103 (WHT.) and applies 6.3V AC from T107 to the crystal ovens. S102 in the ON position lights DS102 (ORN.), applies filament voltage to V101 and V102, and activates the low voltage power supply. The low voltage supply feeds +215V DC to the contacts of the transmit/receive relay K201; feeds −70V bias to the grids of the 6146 RF output tubes; applies −85V to the coils of the transmit/receive relays K201/K202; supplies microphone bias current for HS101 through R118 and R117; and supplies +150V regulated DC to crystal oscillator V209 and balanced modulator V211.

(b) Turning on the transmitter switch S103 (S101 and S102 must be on to make S103 effective) applies AC to transformer T101. This transformer then feeds 6.3V AC to the transmitter filaments. S103 also activates the high voltage supply which supplies +750V DC to the plates of the 6146 RF output tubes.

(c) Switch S108 must be in the "operate" position. This closes the microphone circuit, from the local handset HS101, through section 3 of switch S108 to section 3 of switch S109. It also applies +215V DC to relay K102 through section 2 of switch S108.

Switch S109 must be in the "local" position. This connects the microphone of the handset through section 3 of S109 to the input of the preamplifier V101B and to R117 where current is supplied to operate the microphone. Section 2 of S109 connects the P/T button on the local handset to the ground return of relay K102.

(d) The TELEPHONE-TELEGRAPH/TELETYPE SWITCH S105 must be in the telephone position. This removes the ground on the audio line to V101B and grounds the grid of V103A. This biases off the tone oscillator to insure it will be inoperative.

(e) Depressing the P/T button on the local handset closes the ground return for relay K102. The contacts of K102 close and complete the ground return for the transmit/receive relays K201 and K202. This switches the equipment to transmit.

The section "A" contacts of K201 connect the antenna to the transmitter. The section "B" contacts of K201 feed +215V to the transmitter and also to terminals #1 of TB103 and TB104 to which the remote handsets are connected. This voltage lights the red signal at all remote locations to show the transmitter is in operation.

The section "A" contacts of K202 apply a ground to the "EXT. REC. MUTE" terminal on TB203 to mute any external receiver connected.

The speech signal originating at the microphone of Handset HS101 is fed through section 3 of switch S108 and section 3 of switch S109 to the input of V101B through capacitor C111. The signal is amplified by V101B, and fed to the clipper V102. The clipper limits audio peaks, and applies the clipped signal to the audio amplifier V101A. Here it is again amplified and fed to the transmitter. The audio signal level to the transmitter is controlled at the input of V101A by potentiometer R257.

(f) Control of Radiophone transmission by the voice controlled VOK-10 relay is shown by dotted lines in the above diagram. When the MANUAL/VOK switch S106 is set to VOK, the ground return for relay K102 is changed from the P/T button on the handset to internal contacts in the VOK-10 relay unit.

Under these conditions when the operator speaks an audio signal appears at the output of the speech clipper V102 pin 5. This signal is fed to the VOK-10 relay through the VOK Sensitivity control R137. The audio signal actuates the VOK-10 relay to complete the ground return for K102. The audio level necessary to actuate the relay is controlled by the front panel VOK sensitivity cotnrol R137. When K102 is energized, the operation is the same as performed by closing the P/T button. When the operator stops speaking the effect is the same as releasing the P/T button on the handset.

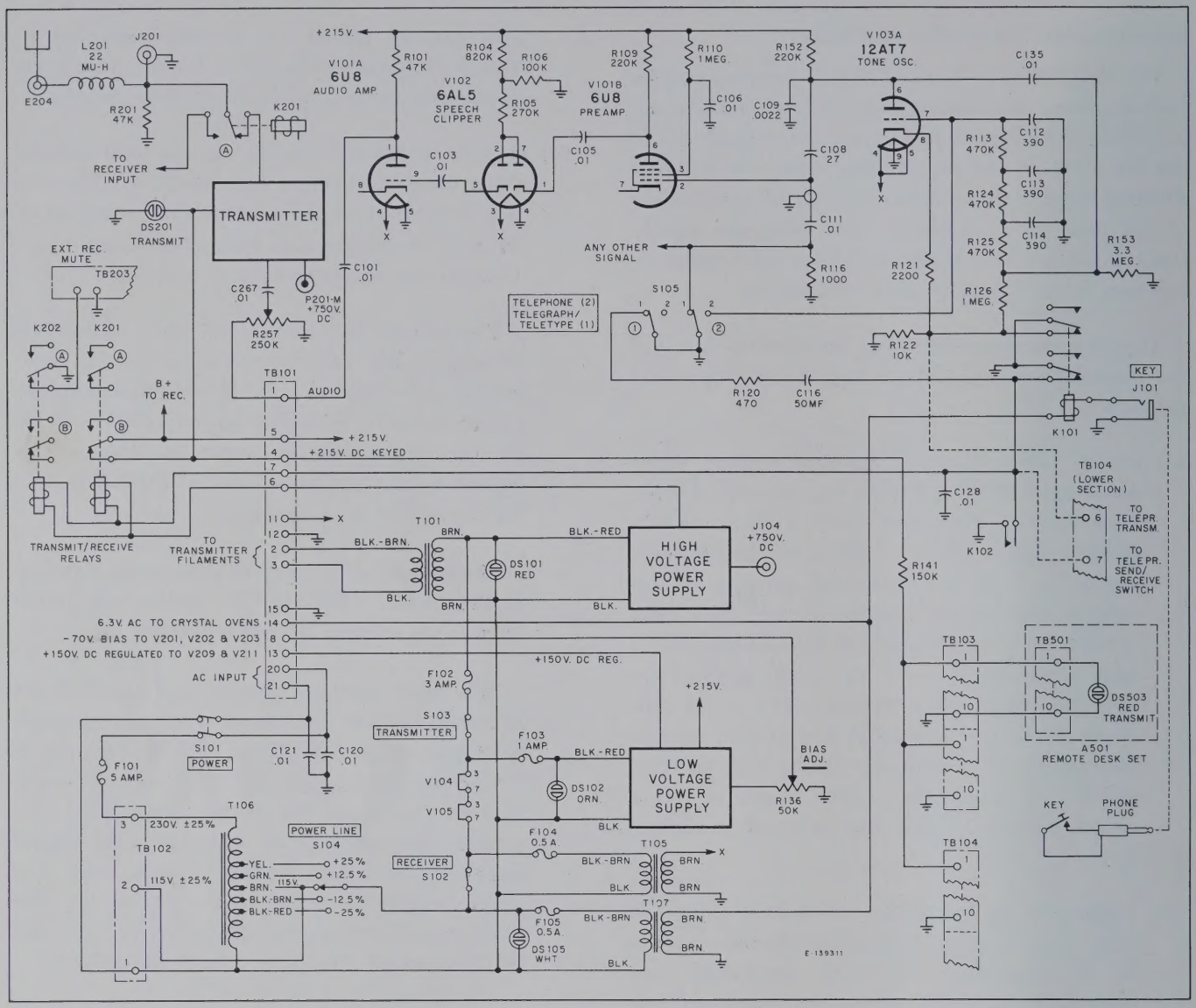


Fig. 56—Simplified Diagram, ON-OFF Telegraph/Teletype Transmit Function

ON-OFF TELEGRAPH/TELETYPE TRANSMIT FUNCTION

The TELEGRAPH/TELETYPE function permits hand telegraph or teletype transmission from the local operating position. The transmission of teleprinter signals employs substantially the same circuitry used for hand telegraph transmission. Refer to Section V—OPERATION for information on transmission of two-tone audio frequency telegraph signals.

The above diagram, figure 56, shows the circuitry involved for hand telegraph transmission from the local operating position.

(a) When power switch S101 is turned on, panel light DS103 (WHT.) lights and 6.3V AC is applied to the crystal ovens and the keying relay K101 by transformer T107. S102 lights panel light DS102 (ORN.) and applies filament voltage to V101, V102 and V103. It also energizes the low voltage power supply. The low voltage supply feeds +215V DC to the contacts of the transmit/receive relay K201; feeds −70V bias to the grids of the 6146 RF output tubes; applies −85V to the coils of the transmit/receive relays K201 and K202; and supplies +150V regulated DC to crystal oscillator V209 and balanced modulator V211.

(b) When transmitter switch S103 is turned on, (S101 and S102 must be closed to make S103 effective) AC is applied to transformer T101. This transformer feeds 6.3V AC to the transmitter filaments. S103 also activates the high voltage supply to supply +750V DC to the plates of the 6146 RF output tubes.

(c) The TELEPHONE-TELEGRAPH/TELETYPE switch S105, must be in the TELEGRAPH/TELETYPE position. The lower contacts of S105 ground the audio line to V101B. This prevents any audio signal that might inadvertantly be on the speech input line to V101B, from feeding to V101B. The lower contacts of S105 also remove the ground on the grid of the tone oscillator V103A. The supper contacts of S105 close the ground return for the delay circuit R120/C116 which is connected to the ground return of the transmit/receive relays K201 and K202.

The MANUAL/VOK switch should be in the MANUAL position to prevent the VOK-10 relay from operating as the transmitter is keyed.

(d) A hand telegraph key must be connected to the key jack J101. Depressing this key completes the ground return for the keying relay K101 and actuates the relay. The lower set of contacts of K101 complete the ground return for the transmit/receive relays K201 and K202. This switches the equipment to transmit.

The upper set of contacts on K101 bridge R122 the cathode resistor of the tone oscillator V103A. This allows the oscillator to produce its 1000 cps tone signal. The tone signal is applied to V101B through capacitor C108. It is amplified by V101B, fed through V102 and capacitor C103 to the grid of V101A. It is further amplified by V101A. It is then fed through capacitor C101 and resistor R257 to the transmitter input. R257 controls the signal level applied to the audio input of the transmitter.

(e) As explained above, the lower contacts of the keying relay K101, complete the ground return for the transmit/receive relays K201 and K202. This energizes the relays. The section "A" contacts of relay K201 connect the antenna to the transmitter. The section "B" contacts of K201 feed +215V to the transmitter and also to terminals 1 of TB103 and TB104. This applies voltage to the red signal lights on the remote handsets to indicate to the remote operators when the transmitter is in operation.

The section "A" contacts of K202 apply a ground to the "EXT. REC. MUTE" terminal on TB203 to mute any external receiver connected to this terminal.

(f) The time delay circuit R120/C116, connected to the ground return of the transmit/receive relays, prevents changeover relay action during normal "Key-up" intervals. Capacitor C116 charges through resistor R120 during the key-up period and holds the transmit-receive relays closed. This relieves the transmit/receive relays from rapidly following each "make" and "break" of the key. Any sustained pause in keying allows capacitor C116 to discharge. Then relays K201 and K202 deenergize and return to the receive position.

NOTE:—Monitoring of transmitted telegraph signals is possible by switching S108 to the MONITOR position. The tone signal present at the plate of V101A will then be fed to the audio output tube V107 through section 1 of S108 as outlined under the "MONITOR FUNCTION", page 69.

(g) The additional circuitry involved for simplex ON-OFF tone teleprinter operation is shown by dotted lines in the diagram.

The teletype equipment performs two functions when transmitting ON-OFF signals through the SSB-1 Mk. IV equipment. Note that the dotted line coming from terminal 7 of the lower section of TB104 is shown connected to the ground return of the transmit/receive relays K201 and K202. Grounding this line will cause the transmitter to be energized. The send/receive switch on the teleprinter equipment grounds this line when the switch is in the "send" position. This places the SSB-1 Mk. IV equipment in the transmit condition.

The second dotted line from terminal 6 of TB104 connects to resistor R122. Grounding this point will cause the tone oscillator to operate and produce the 1000 cps tone. The line at terminal 6 of TB104 connects to the transmitter in the teleprinter equipment. The teleprinter transmitter grounds and ungrounds the line in step with the "TELETYPE" code. This causes the tone oscillator to produce 1000 cps tone segments which conform to the "TELETYPE" code information. These signals feed to the transmitter in the manner employed for normal hand telegraph keying.

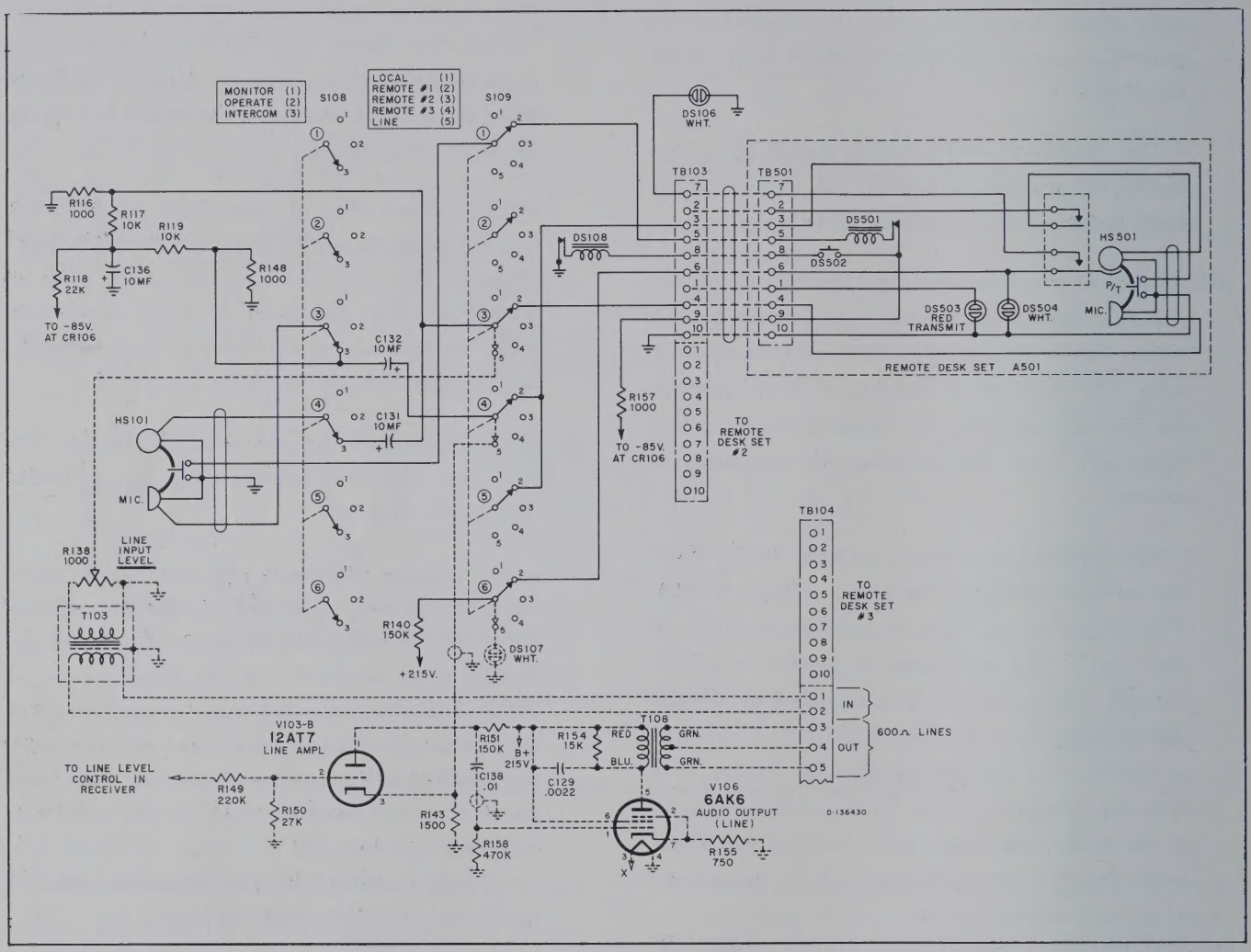


Fig. 57—Simplified Diagram, Intercom Function

INTERCOM FUNCTION

The Intercom function permits audio communication between the local and remote locations. Selection of the desired location is achieved, at the local operating position, by use of the local/remote switch S109. Provision is also made for signaling between the local and remote position selected.

The diagram, figure 57, presents the circuitry involved in a typical intercom operation. Remote location #1 is shown connected to the local operating position. Identical functions would be performed for either of the other two remote positions. Paragraph (f) details line operation in the Intercom function.

(a) Turning switch S108 to "intercom" supplies microphone current to the local handset through section 3 of S108, and also connects the microphone output to section 4 of S109. The local headphone is connected to section 3 of S109 through section 4 of S108.

(b) With S109 in the Remote #1 position, as shown in the diagram, the local push/talk button is connected through section 1 of S109 to the Remote #1 location. Microphone current is supplied to the remote location via the contacts of section 3 of S109. Audio output from the local position microphone is fed to the remote location through the section 4 contacts of S109. The +215V supply, for operation of the remote buzzer DS501 and signal light DS104, is fed to the remote location by section 6 of S109.

The remote signal light DS504 goes on immediately when S109 is thrown to the remote #1 position. This informs the party at the remote location that he is connected to the local operating position.

(c) Depression of the Push/Talk button on the local handset actuates the remote buzzer DS501, signaling the remote location, by providing the ground return for the buzzer DS501.

(d) Signaling the local position from the remote location is accomplished in two ways.

Lifting the remote handset from its cradle lights the signal light DS106 for remote position #1 at the local operating position. This is accomplished by closing of the contacts in the cradle assembly thereby connecting DS106 to the +215V supply at terminal 6 of TB103.

When the local operator does not respond to the signal light, closing of switch DS502 at the remote location will actuate buzzer DS108 at the local position by providing voltage to the local buzzer, thereby signaling the local operator.

(e) Once contact has been established between the two locations, normal telephone conversation can be carried on. It is not necessary for the local push/talk button to be depressed when speaking, the button is used only for signaling. Depression of the push/-talk button on the remote handset will perform no function as it is an open circuit in the intercom operation.

(f) Line position operation is shown by the dotted lines in figure 57. When selector switch S109 is turned to the "Line" position, the local handset microphone is connected to the line by way of section 4 of S109, through V103B, the Line Amplifier, V106, the Audio Output, and transformer T108 to terminals 3, 4 and 5 of TB104. Control of the signal level to the line amplifier is performed by the Line Level Control. When S109 is switched to the Line position +215 volts is applied to DS107 through the contacts of section 6 (S109) thereby indicating Line operation to the local operator.

The incoming Line signal, from terminals 1 and 2, TB104, feeds through transformer T103 and R138 (which controls the level of the incoming signal) through section 3 of S109, then through section 4 of S108, to the local handset head phone.

THE LOCAL HANDSET PUSH-TO-TALK BUTTON IS INOPERATIVE IN THE LINE POSITION.

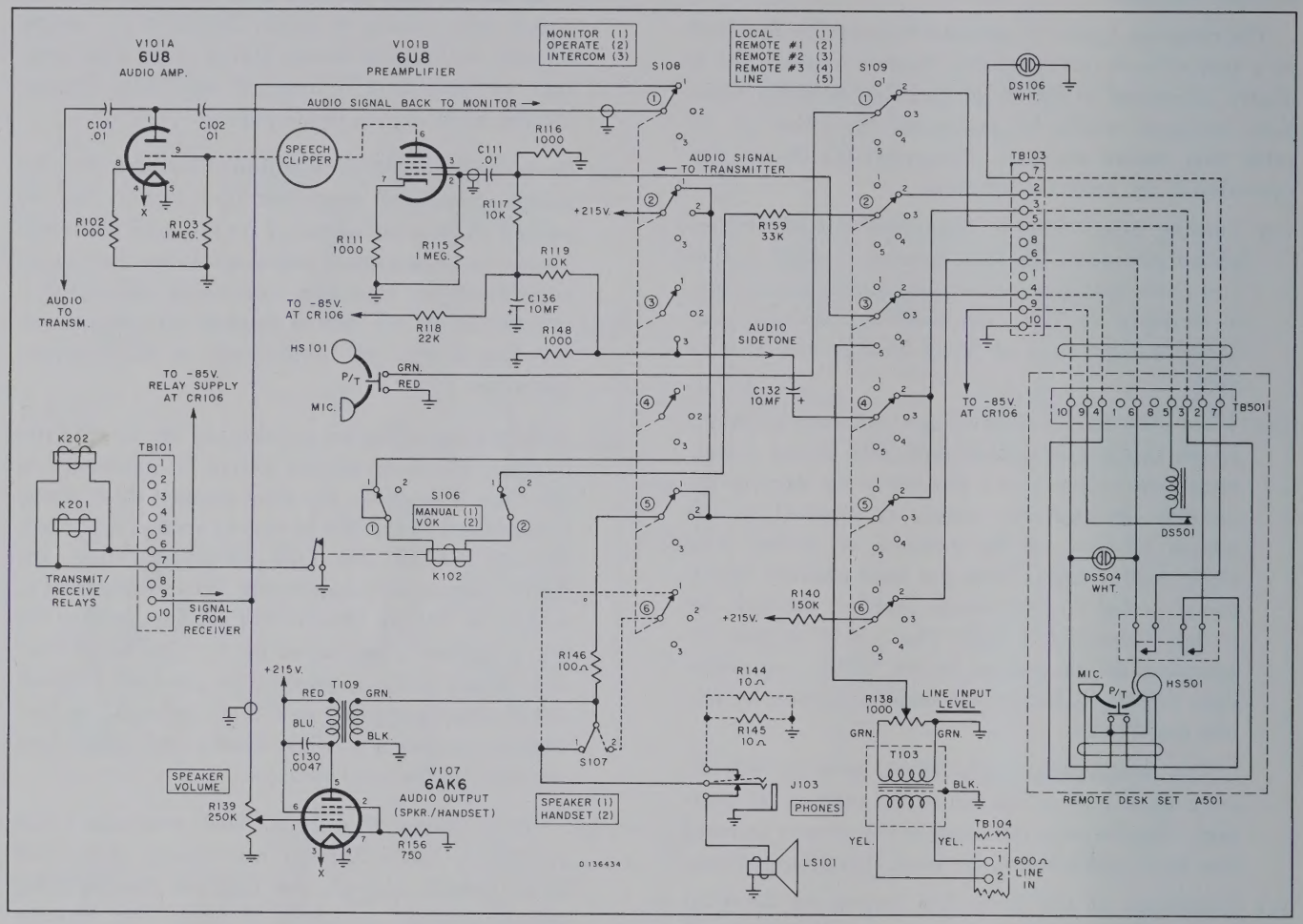


Fig. 58—Simplified Diagram, Monitor Function

MONITOR FUNCTION

The MONITOR function provides monitoring, by the local position, of transmitted speech originating from the remote or line positions. It also allows local monitoring of local telegraph and teleprinter signals. The received signal, being fed back to the remote or line location, is also monitored at the local operating position.

Figure 58 shows the circuitry involved for typical remote operation of the transmitter and receiver. Remote location #1 is shown connected for remote operation. Identical functions would be performed for either of the other two remote positions.

(a) Turning switch S108 to MONITOR position feeds any audio signal, present at the plate of V101A Audio Amplifier, through section 1 of S108 to the grid of V107 AUDIO OUTPUT (Speaker/Handset) tube. The monitor speaker signal level is controlled by R139 Speaker Volume control.

The +215V supply is connected, through section 2 of S108, to relay K102 which must be energized to permit operation of the TRANSMIT/RECEIVE relays K201 and K202.

Section 5 of S108 feeds the audio signal output of V107 to section 5 of the selector switch S109. This signal also appears at the speaker when the SPEAKER/HANDSET switch S107 is in *either* the SPEAKER or HANDSET positions. Switching S107 to the HANDSET position feeds the audio signal through section 6 of S108 to the headphone jack J103 as well as to the speaker. Insertion of the headphone plug in J103 connects the headphones for monitoring and simultaneously disconnects the speaker. With no headphones connected to J103, the speaker will operate in either position of the SPEAKER/HANDSET switch S107.

(b) With S109 selector switch in the REMOTE #1 position, as shown in the above diagram, section 1 of S109 connects the P/T button of the local handset to buzzer DS501 at the remote location. The ground return for relay K102 is connected through section 2 of S109 to the cradle contacts of the REMOTE #1 handset.

Section 3 of S109 connects the remote microphone to the input grid of V101B PREAMPLIFIER. The audio sidetone is fed back to the remote headphone by way of section 4 of S109.

The audio signal from V107 AUDIO OUTPUT tube, coming through section 5 of S108, is fed to the remote headphone by way of section 5 of S109.

The +215 volts, required to operate REMOTE #1 signal light DS504 on the remote handset and the REMOTE #1 signal light DS106 at the local position, is fed directly to DS504 and to remote handset HS501 through section 6 of S109. The remote handset light DS504 goes on immediately when S109 is switched to the REMOTE #1 position.

(c) As the remote handset is removed from its cradle the cradle contacts close. The signal light DS106, for REMOTE #1, goes ON at the local operating position, signifying to the local operator that the remote position is about to operate. The second set of contacts on the cradle connect the P/T button on the remote handset to the ground return of relay K102.

(d) Depressing the P/T button on remote handset HS-501 completes the ground return for relay K102. The contacts of K102 close and complete the ground return for the TRANSMIT/RECEIVE relays K201 and K202 turning on the transmitter.

As the remote operator speaks, an audio signal appears at the plate of V101A AUDIO AMPLIFIER. This signal goes to the transmitter and is also returned to the grid of V107 AUDIO OUTPUT tube. The local operator is thus able to hear the outgoing signal on the speaker (or headphones) at the local position.

When the remote operator releases the P/T button on his handset, the TRANSMIT/RECEIVE relays K201 and K202 return to the receive position. The incoming answering signal at the receiver then feeds to V107 AUDIO OUTPUT tube and the local operator hears the incoming signal.

Should the local operator wish to signal the remote operator, he may do so by depressing the P/T button on the local handset. This operates buzzer DS501 at the remote location.

TUBE SOCKET VOLTAGES

ALL READINGS TAKEN WITH SIMPSON 260

CONDITIONS: AC 115V; DC + 150V; DC + 215V.
AGC OFF: Limiter Off; Lower Sideband; Frequency 3 Mc.
Squelch C.C.W.; Tx. Gain Off.

TUBE	PIN NUMBERS								
	1	2	3	4	5	6	7	8	9
V101 6U8 Preamp./Audio Ampl.	104	0	33	6.3 AC	Gnd.	75	.9	2.15	0
V102 6AL5 Speech Clipper	1.85	1.9	6.3 AC	0	1.9	Shield	1.9		
V103 12AT7 Tone Oscillator	N.C.	N.C.	N.C.	6.3 AC	6.3 AC	140	0	3.5	Gnd.
V104 OD3/VR150 150 v. Volt. Regulator	N.C.	Gnd.	‡	N.C.	150	N.C.	‡	N.C.	
V105 OA3/VR75 Bias Volt. Regulator	N.C.	−72	‡	N.C.	Gnd.	N.C.	‡	N.C.	
V106 6AK6 Audio Output (Line)	0	12	6.3 AC	Gnd.	208	215	12		
V107 6AK6 Audio Output (Speaker)	0	11.5	6.3 AC	Gnd.	208	215	11.5		
V201 6146 Power Amplifier	Gnd.	6.4 AC	212	Gnd.	−49	Gnd.	Gnd.	Gnd.	TOP CAP 750
V202 6146 Power Amplifier	Gnd.	6.4 AC	212	Gnd.	−49	Gnd.	Gnd.	Gnd.	TOP CAP 750
V203 6146 Power Amplifier	Gnd.	6.4 AC	212	Gnd.	−49	Gnd.	Gnd.	Gnd.	TOP CAP 750
V204 6AL5 Mod. Indicator Rectifier	N.C.	Gnd.	6.3 AC	Gnd.	.4	Gnd.	210		
V205 6CL6 Intermediate P.A.	3.8	0	156	6.3 AC	Gnd.	210	Gnd.	156	0
V206 6CL6 Intermediate P.A.	4.2	0	165	6.3 AC	Gnd.	195	Gnd.	165	0
V207 12AT7 Balanced Mod.	172	0	3.72	Gnd.	Gnd.	172	0	3.72	6.3 AC
V208 12AT7 2nd Balanced Mod.	136	0	3.2	6.3 AC	6.3 AC	136	0	3.2	Gnd.
V209 12AX7 1st Balanced Mod.	129	0	1.2	Gnd.	Gnd.	130	0	1.2	6.3 AC
V210 12AX7 Audio Amp./Rec. Muting	175	13.5	37.5	Gnd.	Gnd.	−.2*	−.2*	.15*	6.3 AC
V211 6CL6 4.4-16.4 mc. Crystal Osc.	Gnd.	−2.85	149	Gnd.	6.3 AC	17.5	Gnd.	149	−2.85
V212 6BE6 1150-1650 kc. Crystal Osc.	−4.4	Gnd.	6.3 AC	Gnd.	150	96	94		
V213 6BE6 250 kc. Crystal Osc.	−3.8	Gnd.	Gnd.	6.3 AC	202	74	80		
V214 6BA6 R-F Amplifier	0	1.9	Gnd.	6.3 AC	160	97	1.9		
V215 6BE6 1st Mixer	−3.3	1.9	Gnd.	6.3 AC	210	76	0		
V216 6BE6 2nd Mixer	−.5	1.6	Gnd.	6.3 AC	210	80	0		
V217 12AX7 1st I-F Amplifier	165	0	1.46	Gnd.	Gnd.	162	0	1.46	6.3 AC
V218 6BA6 2nd I-F Amplifier	0	2.2	Gnd.	6.3 AC	203	114	2.2		
V219 6BA6 3rd I-F Amplifier	0	6.0	Gnd.	6.3 AC	203	135	6.0		
V220 6BA6 AGC Amplifier	0	2.2	Gnd.	6.3 AC	203	108	2.2		
V221 6AL5 Demodulator		−9.8	Gnd.	6.3 AC	Gnd.				
V222 6AL5 AGC Diode/Squelch Diode	33	0	6.3 AC	Gnd.	48	Shield	−15*		
V223 12AT7 Audio Amp./Squelch Triode	200	−30.0	1.65	Gnd.	Gnd.	70	0	1.65	6.3 AC

*Voltage depends on Channel noise.
‡Pins 3 and 7 connect to a jumper in tube.
N.C.: No connection to tube elements.

TUBE SOCKET VOLTAGES

ALL READINGS TAKEN WITH VTVM (RCA-WV98A)

CONDITIONS: AC 115V; DC + 150V; DC + 215V.
AGC OFF: Lower Sideband; Channel #1 Frequency 3 Mc.
Limiter Off; Squelch C CW; Tx. Gain "off."

TUBE	PIN NUMBERS								
	1	2	3	4	5	6	7	8	9
V101 6U8 Preamp./Audio Ampl.	112	0	37	6.3 AC	Gnd.	80	.95	2.25	0
V102 6AL5 Speech Clipper	3.65	3.7	6.3 AC	0	3.75	Shield	3.7		
V103 12AT7 Tone Oscillator	N.C.	N.C.	N.C.	6.3 AC	6.3 AC	152	0	3.7	Gnd.
V104 OD3/VR150 150 v. Volt. Regulator	N.C.	Gnd.	‡	N.C.	150	N.C.	‡	N.C.	
V105 OA/VR75 Bias Volt. Regulator	N.C.	−73	‡	N.C.	Gnd.	N.C.	‡	N.C.	
V106 6AK6 Audio Output (Line)	0	12.5	6.3 AC	Gnd.	210	212	12.5		
V107 6AK6 Audio Output (Speaker)	0	12.1	6.3 AC	Gnd.	210	212	12.1		
V201 6146 Power Amplifier	Gnd.	6.4 AC	212	Gnd.	−50	Gnd.	Gnd.	Gnd.	CAP TOP 805
V202 6146 Power Amplifier	Gnd.	6.4 AC	212	Gnd.	−50	Gnd.	Gnd.	Gnd.	TOP CAP 805
V203 6146 Power Amplifier	Gnd.	6.4 AC	212	Gnd.	−50	Gnd.	Gnd.	Gnd.	TOP CAP 805
V204 6AL5 Mod. Indicator Rectifier	N.C.	Gnd.	6.3 AC	Gnd.	.62	Gnd.	210		
V205 6CL6 Intermediate P.A.	4.0	0	158	6.3 AC	Gnd.	210	Gnd.	158	0
V206 6CL6 Intermediate P.A.	4.45	0	175	6.3 AC	Gnd.	200	Gnd.	175	0
V207 12AT7 3rd Balanced Mod.	182	0	3.85	Gnd.	Gnd.	182	0	3.85	6.3 AC
V208 12AT7 2nd Balanced Mod.	150	0	3.35	6.3 AC	6.3 AC	150	0	3.35	Gnd.
V209 12AX7 1st Balanced Mod.	132	0	1.28	Gnd.	Gnd.	132	0	1.28	6.3 AC
V210 12AX7 Audio Amp./Rec. Muting	180	33	39.5	Gnd.	Gnd.	−60V*	−60V*	−11.5*	6.3 AC
V211 6CL6 4.4-16.4 mc. Crystal Osc.	Gnd.	−5.5	150	Gnd.	6.3 AC	20	Gnd.	150	−5.5
V212 6BE6 1150-1650 kc. Crystal Osc.	−8.4	Gnd.	6.3 AC	Gnd.	150	100	97		
V213 6BE6 250 kc. Crystal Osc.	−7.3	Gnd.	Gnd.	6.3 AC	205	75	81		
V214 6BA6 R-F Amplifier	0	2.0	Gnd.	6.3 AC	165	100	2.0		
V215 6BE6 1st Mixer	−4.1	1.85	Gnd.	6.3 AC	210	94	0		
V216 6BE6 2nd Mixer	−3.35	1.7	Gnd.	6.3 AC	210	84	0		
V217 12AX7 1st I-F Amplifier	175	0	1.5	Gnd.	Gnd.	170	0	1.5	6.3 AC
V218 6BA6 2nd I-F Amplifier	0	2.3	Gnd.	6.3 AC	205	117.5	2.3		
V219 6BA6 3rd I-F Amplifier	0	6.2	Gnd.	6.3 AC	205	142	6.2		
V220 6BA6 AGC Amplifier	0	2.25	Gnd.	6.3 AC	204	114	2.25		
V221 6AL5 Demodulator	9	−70	Gnd.	6.3 AC	Gnd.				
V222 6AL5 AGC Diode/Squelch Diode	34.5	0	6.3 AC	Gnd.	49	Shield	−40*		
V223 12AT7 Audio Amp./Squelch Triode	205	−40	1.8	Gnd.	Gnd.	73	0	1.8	6.3 AC

*Voltage depends on Channel noise.
‡Pins 3 and 7 connect to a jumper in tube.
N.C.: No connection to tube elements.

TERMINAL BOARD VOLTAGE AND RESISTANCE READINGS

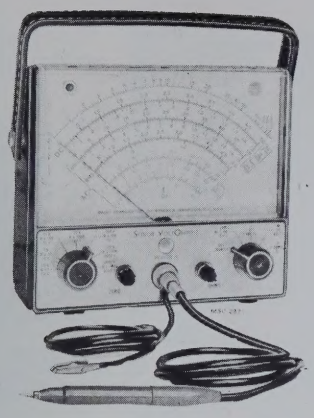
VOLTAGE READINGS WITH VACUUM TUBE VOLTMETER (RCA WV-98A)

CONDITIONS	TERMINAL BOARD	TERMINALS																		
	TB 101	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Key Up Volts		0	0	6.4AC	—1.1	215	—136	—136	—55*	0	0	6.3AC	0	150	6.5AC	0	—4.8	10.4AC		
Key Down Volts		0	0	6.4AC	215	215	—126	0	—54*	0	0	6.3AC	0	150	6.5AC	0	—4.8	10.4AC		
Key Up Resistance		260K	0	0	Inf.	8K	500	7K	15K	160K	10	0	0	9K	0	0	Inf.	Inf.		
Key Down Resistance		260K	0	0	Inf.	8K	500	7K	15K	160K	10	0	0	8K	0	0	Inf.	Inf.		
	TB 103	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
Key Up Volts		—.5	215	0	—2.5	0	215	0	0	—137	0	—.5	215	0	—2.5	0	215	0	0	—137	0
Key Up Resistance		Inf.	52K	95	900	Inf.	150K	Inf.	500	2K	0	Inf.	52K	95	900	Inf.	150K	Inf.	500	2K	0

VOLTAGE READINGS WITH SIMPSON 260

	TB 101	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Key Up Volts		0	0	6.3AC	0	215	—130	—130	—50	0	0	6.3AC	0	150	6.4AC	0	—3.8	5.8AC		
Key Down Volts		0	0	6.3AC	215	215	—120	0	—50	0	0	6.3AC	0	150	6.4AC	0	—3.8	5.8AC		
Key Up Resistance		260K	0	0	Inf.	8K	500	7K	15K	160K	10	0	0	9K	0	0	Inf.	Inf.		
Key Down Resistance		260K	0	0	Inf.	8K	500	7K	15K	160K	10	0	0	8K	0	0	Inf.	Inf.		
	TB 104	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
Key Up Volts		—.5	215	0	—2.5	0	215	0	0	—137	0	0	0	0	0	0	4.3	—136	0	0	
Key Up Resistance		Inf.	52K	95	900	Inf.	150K	Inf.	500	2K	0						9.5K	7.4K	0	0	

All readings on TB 103 and 104 taken with Switch "R" in the Remote 1, 2, 3 and Line Position respectively.
*Voltage depends on channel used.



RCA WV-98A Senior "VoltOhmyst"

DC VOLTMETER:
Seven continuous ranges..0 to 1.5, 5, 15, 50, 150, 500, 1500 volts
Input Resistance (including 1 megohm in probe):
All Ranges .....11 megohms
Sensitivity for the 1.5-volt range .....7.3 megohms-per-volt
Overall accuracy .....±3% of full scale

AC VOLTMETER—Fourteen continuous ranges:
Peak-to-peak ranges.....0 to 4, 14, 42, 140, 420, 1400, 4200 volts
RMS ranges (for sine waves)..0 to 1.5, 5, 15, 50, 150, 500, 1500 volts
Input resistance and capacitance with WG-299B set to AC-OHMS:
1.5, 5, 15, 50, 150-volt ranges—
0.83 megohm (min.) shunted by 70 mmf
500-volt range .....1.3 megohms shunted by 60 mmf
1500-volt range .....1.5 megohms shunted by 60 mmf
Frequency response with WG-299B set to AC-OHMS:
1.5, 5, 15, 50, 150, 500-volt ranges flat from 30 cps to 3 Mc for voltage source having 100-ohm impedance, or lower
Overall accuracy: All ranges.....±3% of full scale

MAXIMUM INPUT VOLTAGES:
DC voltage (with no ac voltage present).....1500 volts
AC voltage (with no dc voltage present):
RMS for sine waves.....1500 volts
Peak-to-peak for sine waves.....4200 volts
Peak-to-peak for complex waves.....2000 volts
Combined ac and dc voltages: Sum of dc and peak ac voltages .....2000 volts

OHMMETER:
Seven continuous ranges.....0 to 1000 megohms
Center scale values..10, 100, 1000, 10,000 ohms; 0.1, 1, 10 megohms

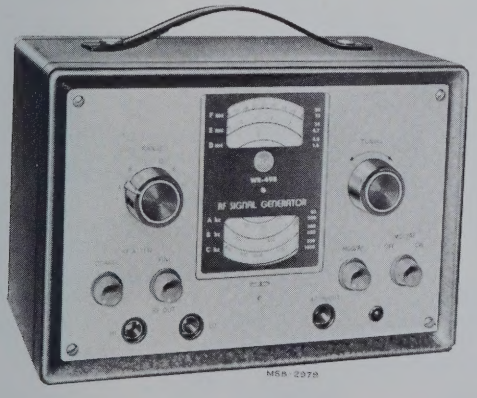
TUBE COMPLEMENT: 1 RCA-6AL5, 1 RCA-12AU7

POWER SUPPLY:
Voltage: 105-125 volts, 50-60 cps
Power Consumption (approx.).....5 watts

BATTERY (1.5-volt cell).....1 RCA-VSO36

OVERALL DIMENSIONS.....6½" high, 7" wide, 3¾" deep

WEIGHT.....6 lbs. net



RCA WR-49B R-F Signal Generator

RF CHARACTERISTICS:
(Six Ranges):
"A" Range.....85 kc to 200 kc
"B" Range.....200 kc to 550 kc
"C" Range.....550 kc to 1600 kc
"D" Range.....1.6 mc to 4.8 mc
"E" Range.....4.7 mc to 14 mc
"F" Range.....13 mc to 30 mc

MAXIMUM RF OUTPUT VOLTAGES (open circuit value):
(All Ranges):
At RF OUT HI Connector.....at least 0.05 rms volt
AT RF OUT LO Connector.....at least 0.01 rms volt
Accuracy of Dial Calibration.....±1%
Attenuator Range.....65 db
Internal Modulating Frequency.....approx. 400 cps
Internal Percentage of Modulation.....adjustable up to 70%
Audio Frequency Output.....at least 8 rms volts across 15,000-ohm load

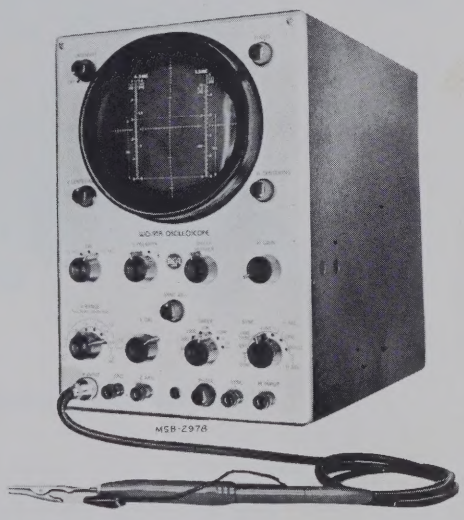
EXTERNAL MODULATION:
Modulating Frequency.....15 kc max.
Voltage required for 30% modulation using 400 cps....10 rms volts
Impedance at AF IN/OUT connector (400 cps)..approx. 16,000 ohms

TUBE COMPLEMENT: 1 RCA-12AU7, 1 RCA-6C4

POWER SUPPLY:
Voltage: 105-125 volts, 50-60 cps
Power Consumption .....15 watts

WEIGHT:.....8 lbs. net

DIMENSIONS:.....7½" high, 10½" wide, 6" deep



RCA WO-91A Oscilloscope

SWEEP OSCILLATOR:
Frequency Range (continuously adjustable).....10 cps to 100 kc
Preset Positions.....30 cps (TV "V"); 7875 cps (TV "H")

Z-AXIS INPUT:
Minimum input voltage for blanking.....12 rms volts
Frequency response.....3 cps to 500 kc

RISE TIME (Vertical Amplifier):
4.5 mc Positions.....0.1 usec
1.5 mc Positions.....0.5 usec

INPUT RESISTANCE AND CAPACITANCE (Vertical Amplifier):
At V INPUT Connector.....1 megohm shunted by 40 mmf
With WG-300A probe set to "DIRECT".....1 megohm shunted by 75 mmf
With WG-300A probe set to "LOW CAP".....10 megohms shunted by 11 mmf
Horizontal Amplifier (At H INPUT terminal).....2.2 megohms shunted by 30 mmf
SYNC Input Terminal.....0.5 megohm shunted by 35 mmf

FREQUENCY RESPONSE (Reference frequency, 10 kc)
Vertical Amplifier:
Wide-Band Positions (10 cps to 4.5 mc).....within ±1 db
Narrow Band (High-Sensitivity) Positions
10 cps to 0.5 mc.....within —1 db
10 cps to 1.5 mc.....within —6 db
Horizontal Amplifier (10 cps to 500 kc).....within —6 db

DEFLECTION SENSITIVITY:	4.5-mc (Wide-Band) Positions		1.5-mc (High-Sensitivity) Positions	
Vertical Amplifier:	rms	p-p	rms	p-p
At V INPUT Connector.....	0.053	0.15	0.018	0.05 volt/in
With WG-300A set to "DIRECT"	0.053	0.15	0.018	0.05 volt/in
With WG-300A set to "LOW CAP"	0.53	1.5	0.18	0.5 volt/in

Horizontal Amplifier (at H INPUT terminal).....0.18 rms volt/in

POWER REQUIREMENTS:
Voltage.....105-125 volts, 50-60 cps
Average Power Consumption.....65 watts

TUBE COMPLEMENT: 1 RCA-6AN8, 2 RCA-6J6, 1 RCA-12AT7, 1 RCA-12AU7, 1 RCA-12AX7, 1 RCA-563-GT, 1 RCA-1V2, 1 RCA-5UP1

DIMENSIONS:.....13½" high, 9" wide, 16½" deep

WEIGHT:.....30 lbs. net

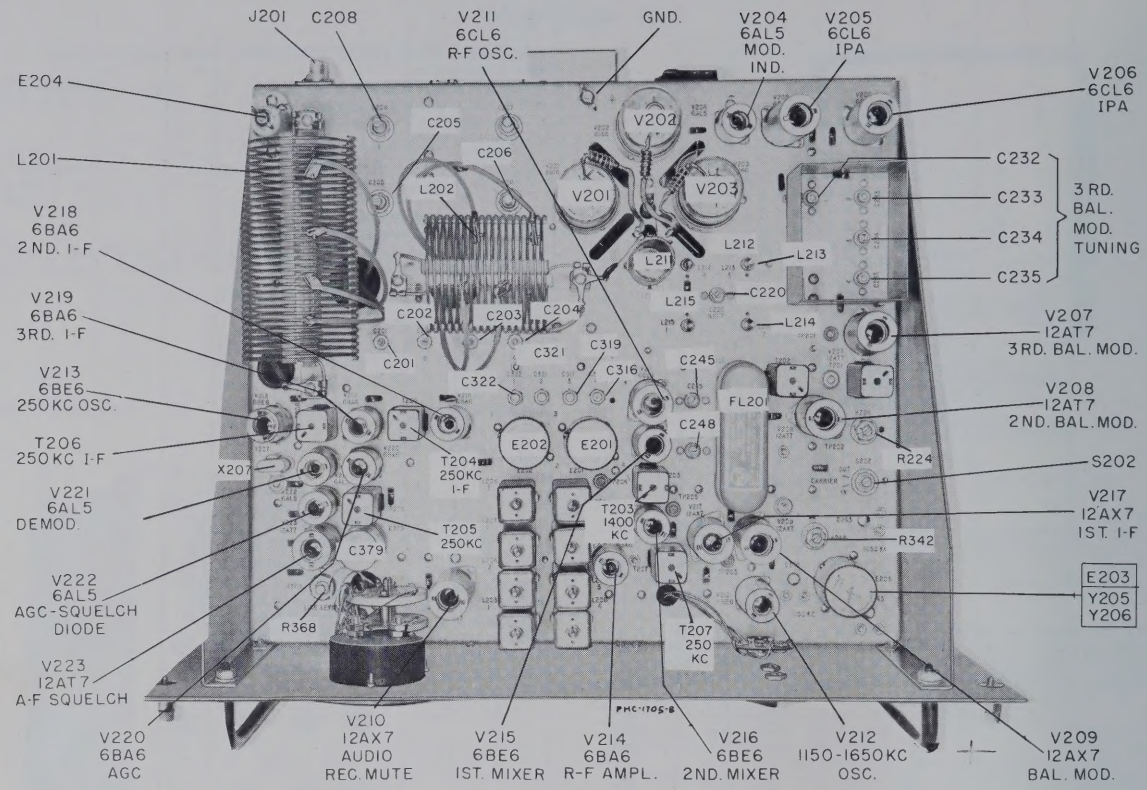


Fig. 59—Top View, Transmitter/Receiver Chassis, showing component locations

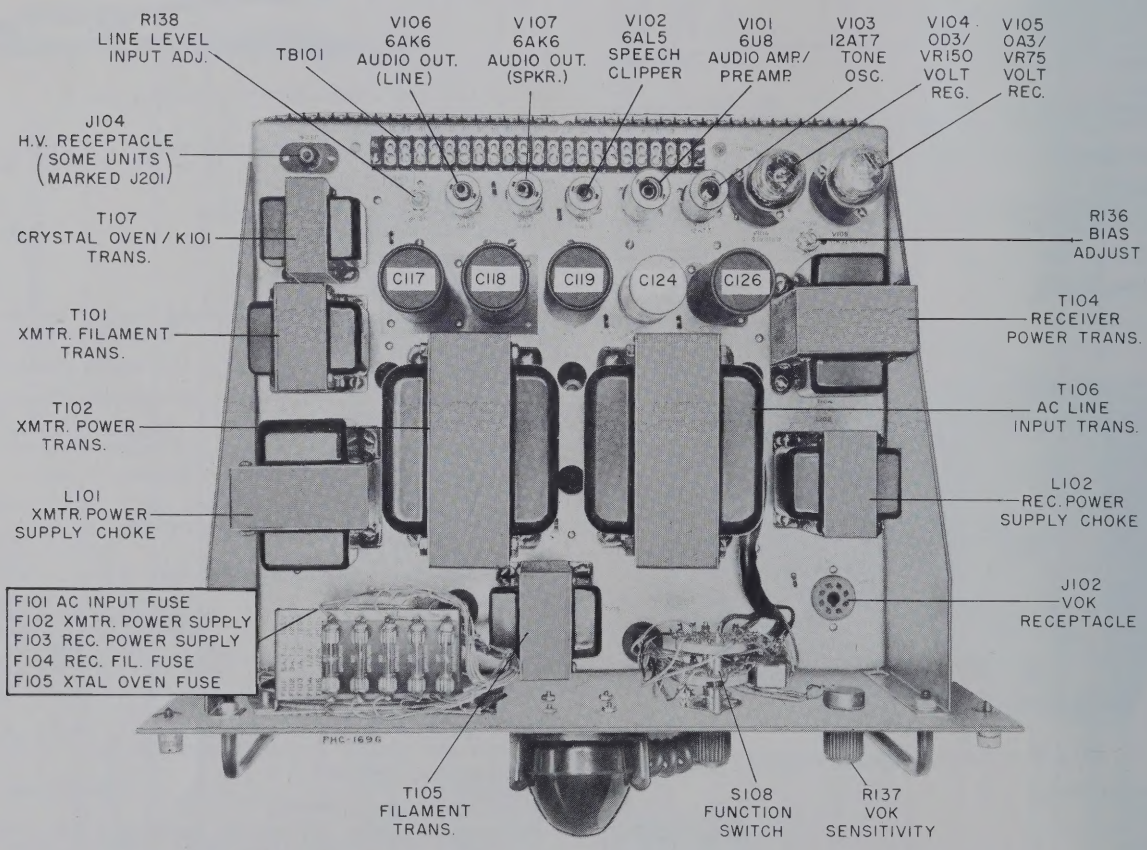


Fig. 60—Top View, Power Supply Chassis, showing component locations

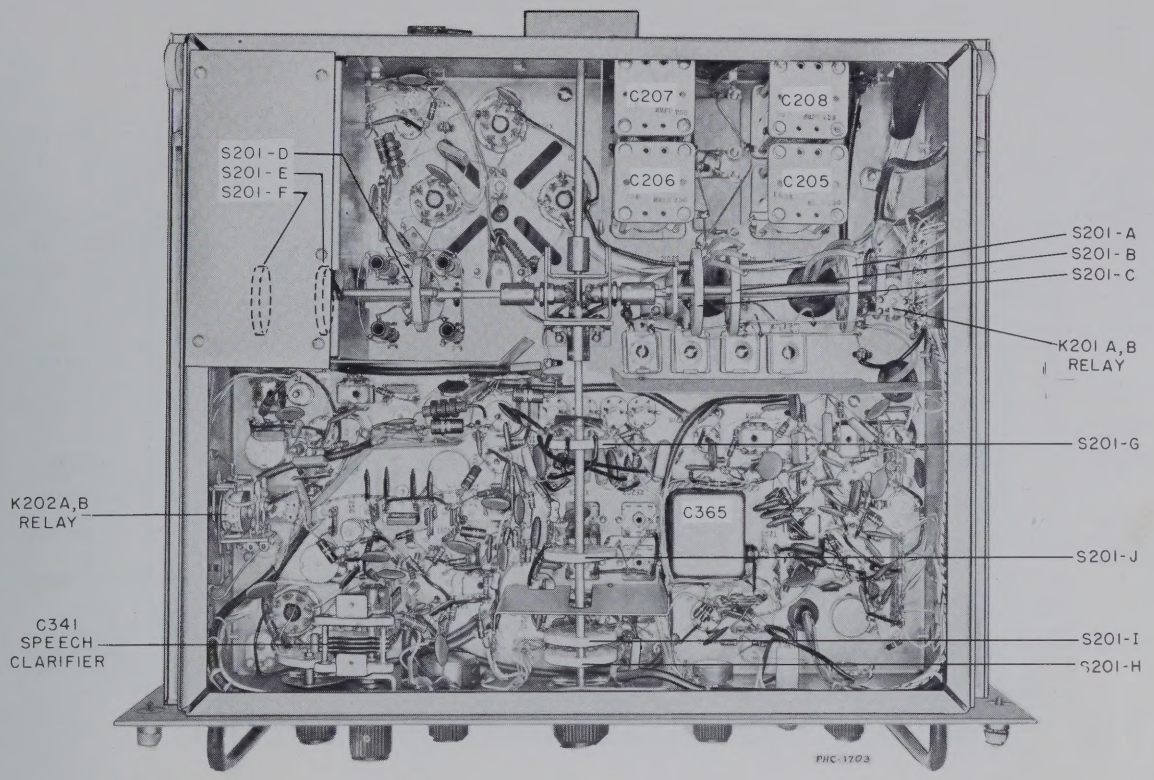


Fig. 61—Bottom View, Transmitter/Receiver Chassis, showing component locations

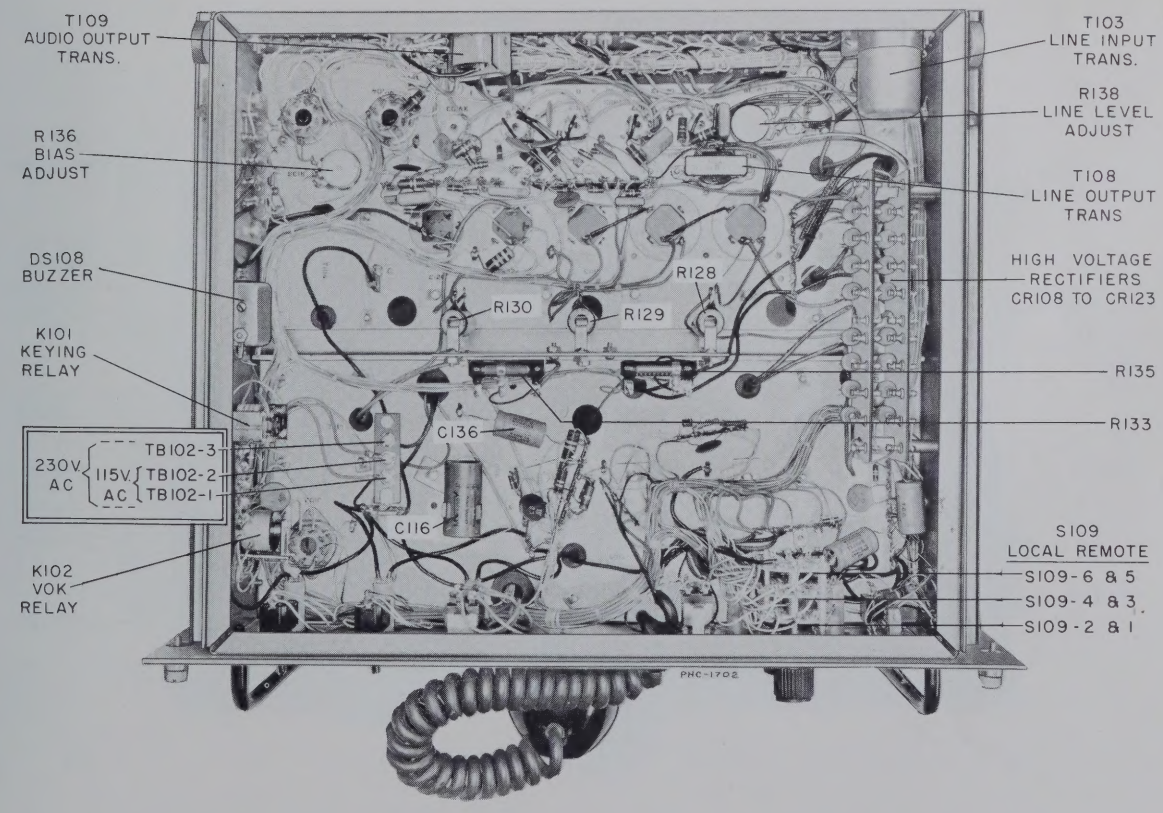


Fig. 62—Bottom View, Power Supply Chassis, showing component locations

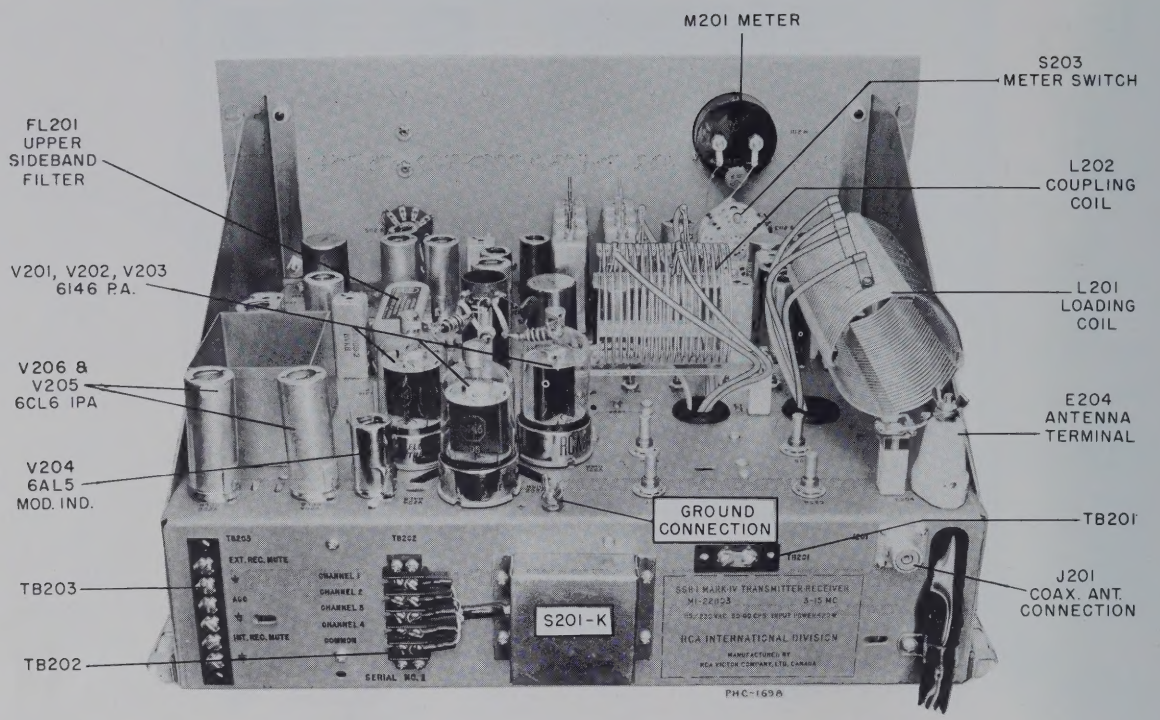


Fig. 63—Rear View, Transmitter/Receiver Chassis, showing component locations

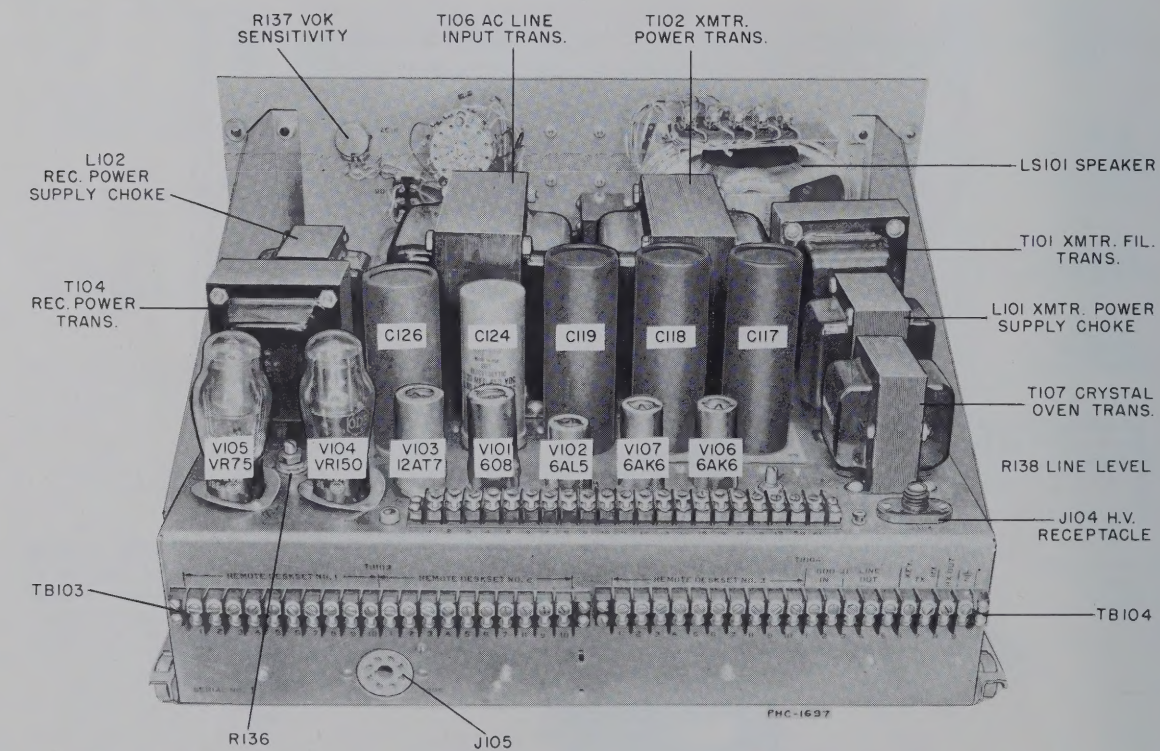


Fig. 64—Rear View, Power Supply Chassis, showing component locations

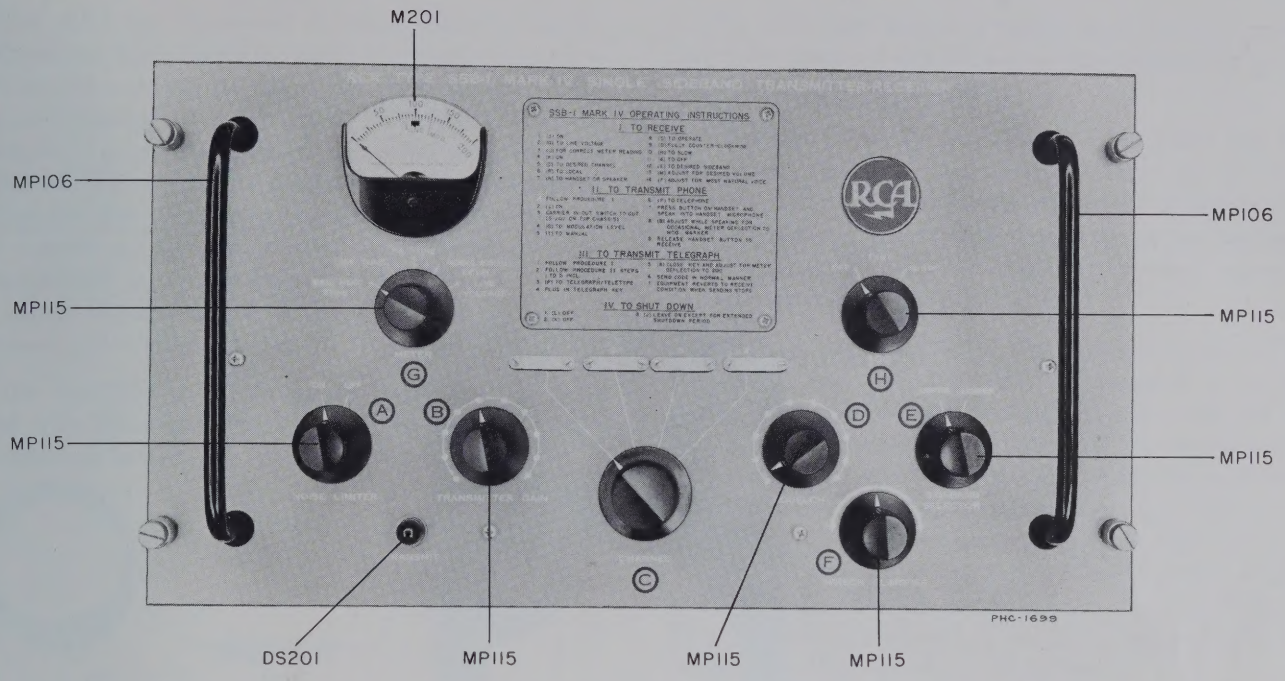


Fig. 65—Front View, Transmitter/Receiver Unit

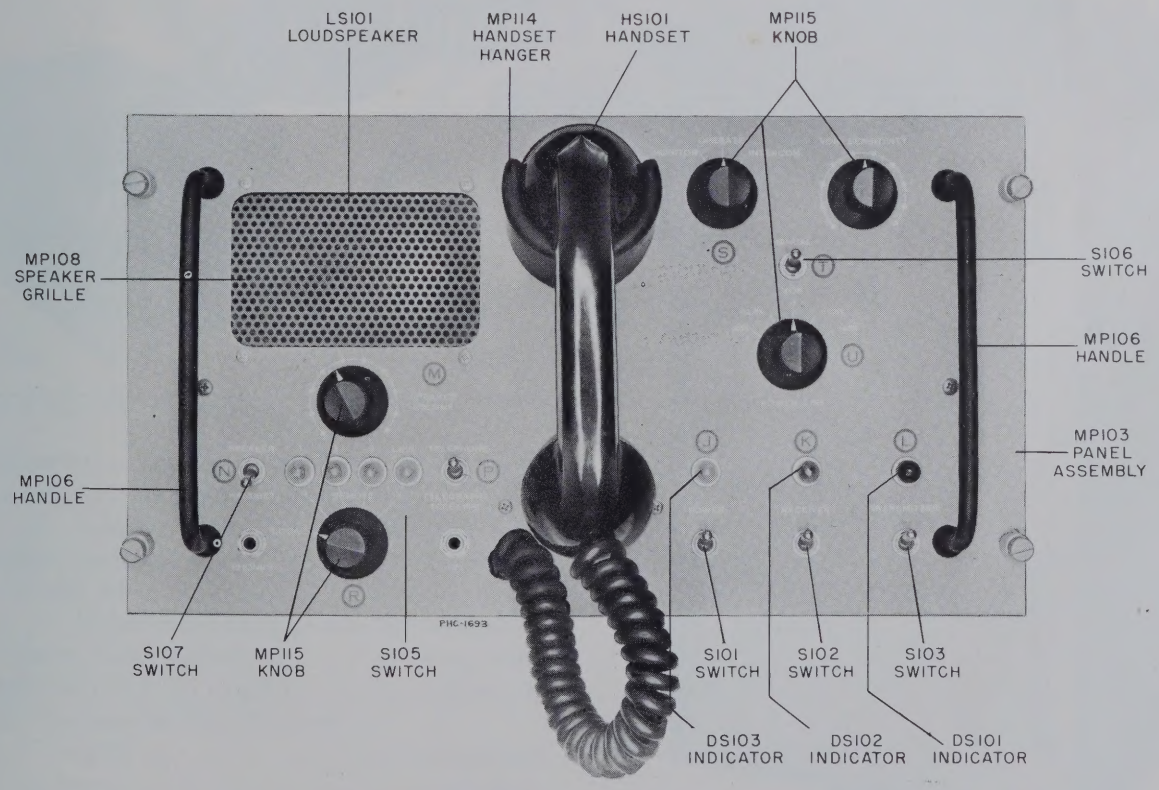


Fig. 66—Front View, Power Supply Unit

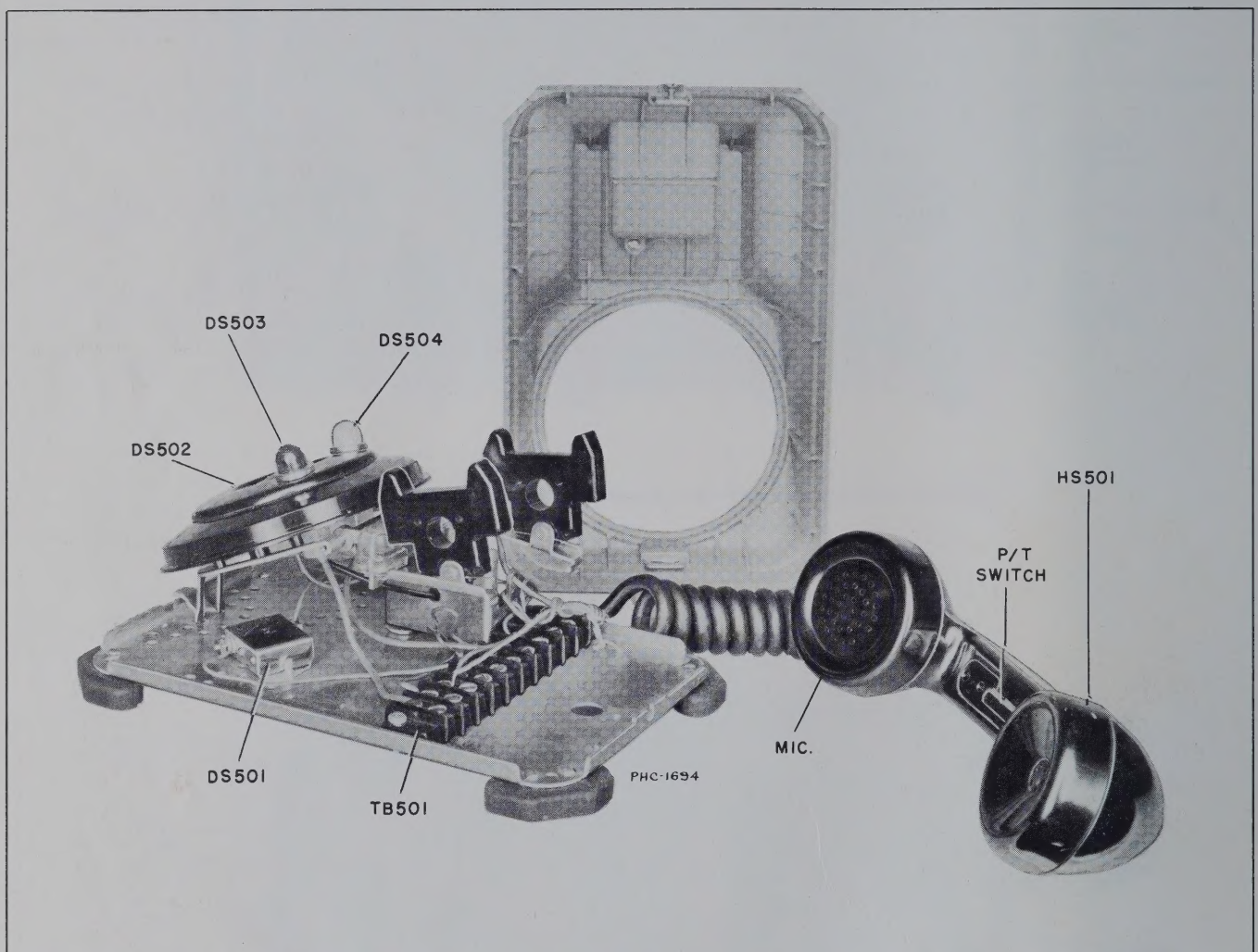


Fig. 67—Remote Deskset, Component Locations

Section VII
ACCESSORIES

AAT-100 AUTOMATIC ANTENNA TUNER

The AAT-100 Automatic Antenna Tuner is an impedance matching device to couple a transmitter/receiver to a multi-band antenna. The tuner can be pre-set to four channels within the range of the SSB-1 Mk. IV equipment. This arrangement makes it possible to operate the SSB-1 Mk. IV on four pre-set channels with one antenna. When the channel selector of the SSB-1 Mk. IV changes the operating frequency, the AAT-100 Antenna Tuner automatically selects the pre-set tap on the coupling coil to match the impedance of the transmission line and antenna to the SSB-1 Mk. IV.

The AAT-100 shown in figure 68 is designed to be used with SSB-1 equipment but may be used with other transmitters having a power output up to 100 watts.

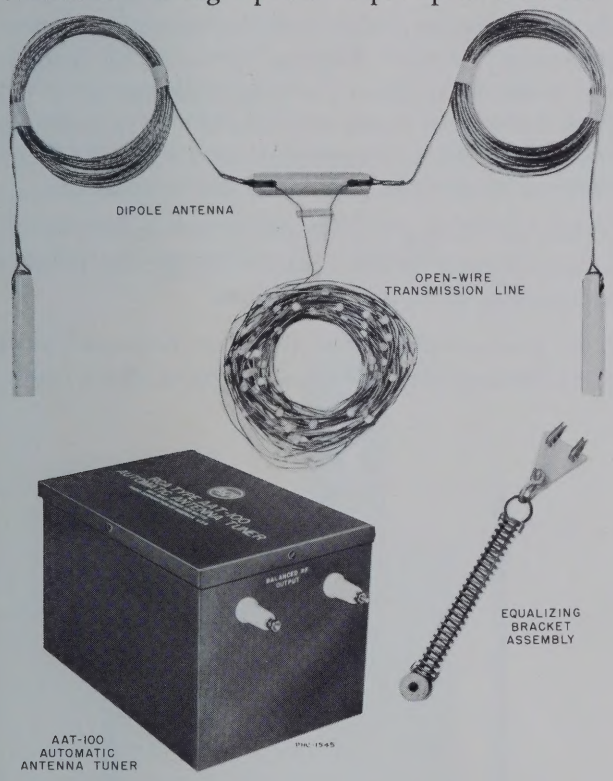


Fig. 68—AAT-100 Automatic Antenna Tuner

The following accessories are used with the AAT-100.

Five-wire control cable (Belden type 8425)—
length required to be specified with order
Control-cable connector ..... (supplied)
RG/8U Coaxial cable, 52 ohms—
length required to be specified with order
RG/8U Coaxial-cable connector ..... (supplied)
Dipole antenna (78 ft. in length)..... (supplied)
Open-wire transmission line, 450 ohms
(33 ft. in length) ..... (supplied)
Antenna insulators ..... (supplied)
Tuner mounting hardware ..... (supplied)
Equalizing bracket assembly ..... (supplied)

SBA-1000 LINEAR POWER AMPLIFIER

The SBA-1000 shown in figure 69 is a linear power amplifier designed specifically for the transmitter of the RCA type SSB-1 equipment.

When the SBA-1000 is connected to the SSB-1 Mk. IV, the Power Amplifier produces an output up to 1000 watts (peak envelope power). After proper installation and adjustment, the combined equipments are operated as a single unit. All switching and frequency selection is controlled by the SSB-1 Mk. IV.

Although the SBA-1000 can be remotely controlled by the SSB-1 Mk. IV, the units are designed to be an integrated assembly by mounting the SSB-1 Mk. IV on top of the SBA-1000. If the SSB-1 Mk. IV equipment is to be used with the SBA-1000 Linear Power Amplifier, the SSB-1 Mk. IV may be mounted on top of the Power Amplifier. To do this, remove the four angle-brackets from under the top of the SBA-1000 cabinet and mount the brackets on the top of the cabinet. The angles should be positioned so they will fit inside the base of the SSB-1 when placed on top of the SBA-1000.

When the Linear Power Amplifier is operated in conjunction with the SSB-1 Mk. IV, a 5-wire cable should be used to connect terminals 6, 7, 8, 9 and 10 of TB202 on the SBA-1000 to terminals 1, 2, 3, 4 and C (common)

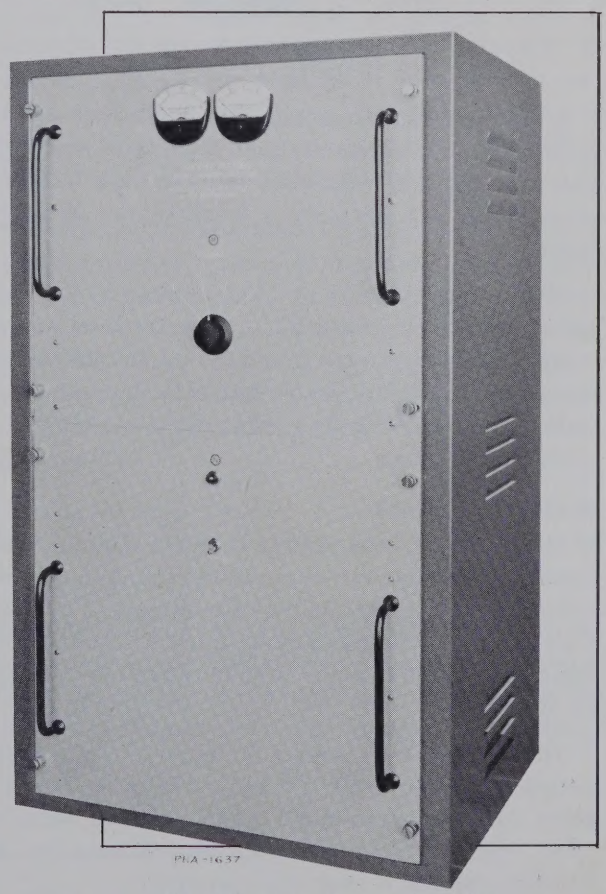


Fig. 69—SBA-1000 Linear Power Amplifier

on terminal board TB202 on the SSB-1 Mk. IV. The channel selector on the SSB-1 Mk. IV will then automatically change channels in the SBA-1000.

Another feature of the Linear Power Amplifier when connected to the SSB-1 Mk. IV, is the ease of switching from high to low power. By simply turning off the power switch of the SBA-1000, the SSB-1 Mk. IV can be operated without making changes to the equipment.

REMOTE DESKSET

A telephone deskset is available as accessory equipment for the SSB-1 Mk. IV. Up to three telephone desksets may be remotely located and connected to the SSB-1 Mk. IV. Figure 70 shows a photograph of the deskset accessory.

Fig. 70—Remote Deskset Unit

A remote deskset extends the capabilities of the local handset to a remote location. When the transmitter LOCAL-REMOTE switch has been set to a REMOTE, transmission and reception is possible from the remote deskset.

When the handset at the remote location is removed from its cradle, a white light signals the local operator. Audio signalling is also provided by a buzzer and push button located at the remote and local positions. A red neon light flashes at the remote deskset whenever the transmitter is in use.

SELECTIVE CALLER

The RCA type MI-625993 Selective Calling Unit is intended to originate the calling signal required to operate the RCA type 27 Selective Ringer. The Calling Unit is a two-tone generator designed to transmit coded signals by means of a dial telephone over the SSB-1 Mk. IV transmitter.

The Calling Unit, shown in figure 71, may be connected to an SSB-1 Mk. IV or to a Remote Deskset. In either case, connections are made with the cables supplied with the unit. After the output level has been adjusted, the unit is ready for operation.

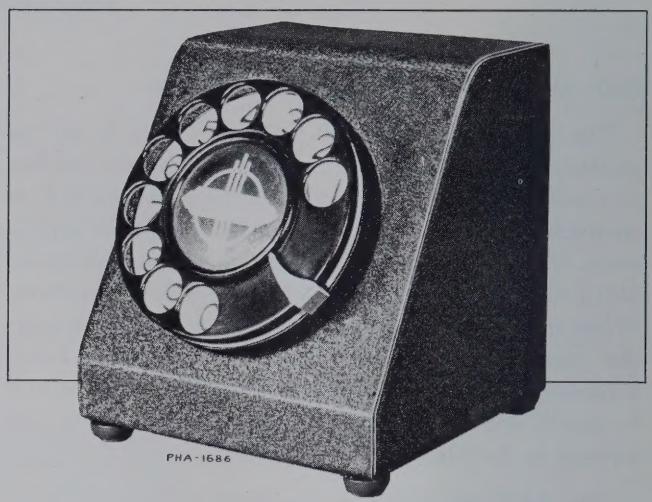


Fig. 71—Selective Caller Unit

A telephone type dial is used for sending a two-tone signal to the Selective Ringer. When the call is originated at the SSB-1 Mk. IV, the Local-Remote switch is placed in the Remote #1 position before the number is dialed. After dialing, the switch is returned to Local and Operation proceeds in the normal manner.

When the Calling Unit is used at a Remote Deskset, the Local-Remote switch is set to the Remote position corresponding to the Remote Deskset.

The "press-to-talk" button should not be pressed while dialing although the handset may be on or off the cradle.

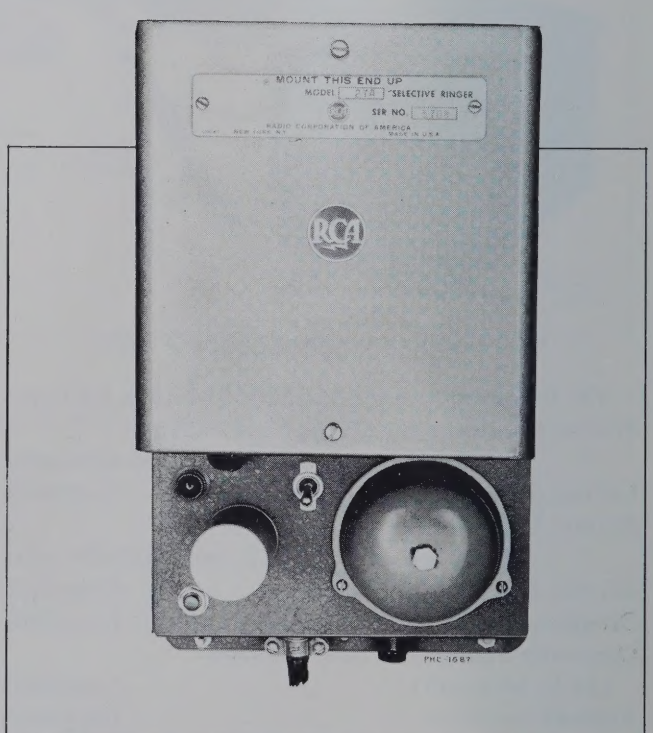


Fig. 72—Selective Ringer Unit

SELECTIVE RINGER

The RCA type MI-555047-A Selective Ringer is the receiving unit in the audio-frequency selection signalling system. The Selective Ringer is designed to ring a bell when the correct two-tone signal is received from the Selective Calling Unit. The use of an individual code, similar to a telephone number, enables any one of a group of stations operating on the same channel frequency to be signalled. Thousands of numbers can be coded with the flexible coding system used in the Selective Ringer. A photograph of the Selective Ringer is shown in figure 72.

When the Selective Ringer is connected to the SSB-1 Mk. IV receiver, the equipment is ready to receive calls whenever the SSB-1 receiver is in operation.

VOICE-OPERATED RELAY

The RCA type VOK-10 Voice-operated Relay is a desirable accessory for the SSB-1 Mk. IV transmitter. The VOK-10 unit (figure 73) causes the transmitter to go "on the air" whenever a sound is received in the microphone of the handset. Limited duplex operation is possible without duplicate equipment since the SSB-1 Mk. IV will automatically switch to "receive" whenever the operator stops talking for a moment.

Fig. 73—VOK-10 Unit

The Voice-operated Relay is easily installed. It is a small plug-in unit readily mounted in the socket provided on top of the chassis of the SSB-1 Mk. IV. All operating voltages for the unit are obtained from the power supply through the socket connections.

SBR-1 SELECTABLE SINGLE SIDEBAND RECEIVER

The RCA SBR-1, shown in figure 74, is a six-channel double conversion superheterodyne for receiving signals in the frequency range from 3 to 25 megacycles. The receiver includes all of the features incorporated into the

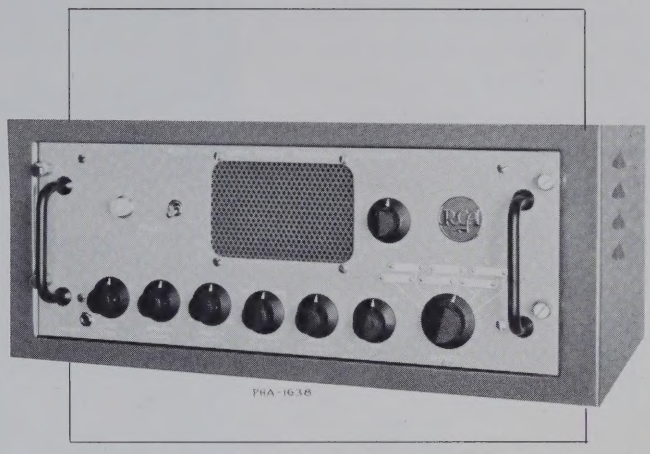


Fig. 74—SBR-1 Selectable Single Sideband Receiver

SSB-1 Mark IV receiver section. Two additional receiving channels extend the frequency range to 25 megacycles and make available twelve usable receiving channels (upper or lower sideband of each of the six crystal-controlled frequencies).

A variety of applications in which the SBR-1 can be used include: frequency monitoring, full duplex voice operation, simplex voice operation with single sideband transmitters, alarm system operation, and simplex or full duplex operation for telegraph or teleprinter service. Although intended primarily as a companion unit to the RCA SSB-1 Mark IV transmitter/receiver, the SBR-1 can also be used with any other similar equipment.

Used with RCA SSB-1 Mark IV equipment the SBR-1 permits full duplex operation. In addition, the six pretuned receiving channels in the SBR-1 extend the number of receiving channels available for any SSB-1 system. The six SBR-1 channels include two channels in the 3 to 7.5 mc range, two channels between 7.5 and 15 mc, and two channels in the frequency range between 15 and 25 megacycles.

Constructed on a compact chassis, the SBR-1 can be rack-mounted or, housed in its own cabinet may be placed on a desk, table-top or any convenient location.

The SBR-1 is supplied complete with tubes, self-contained power supply and low-level operational crystals, installed in its cabinet. Channel frequency crystals are supplied to order as separate items and are not included with the receiver.

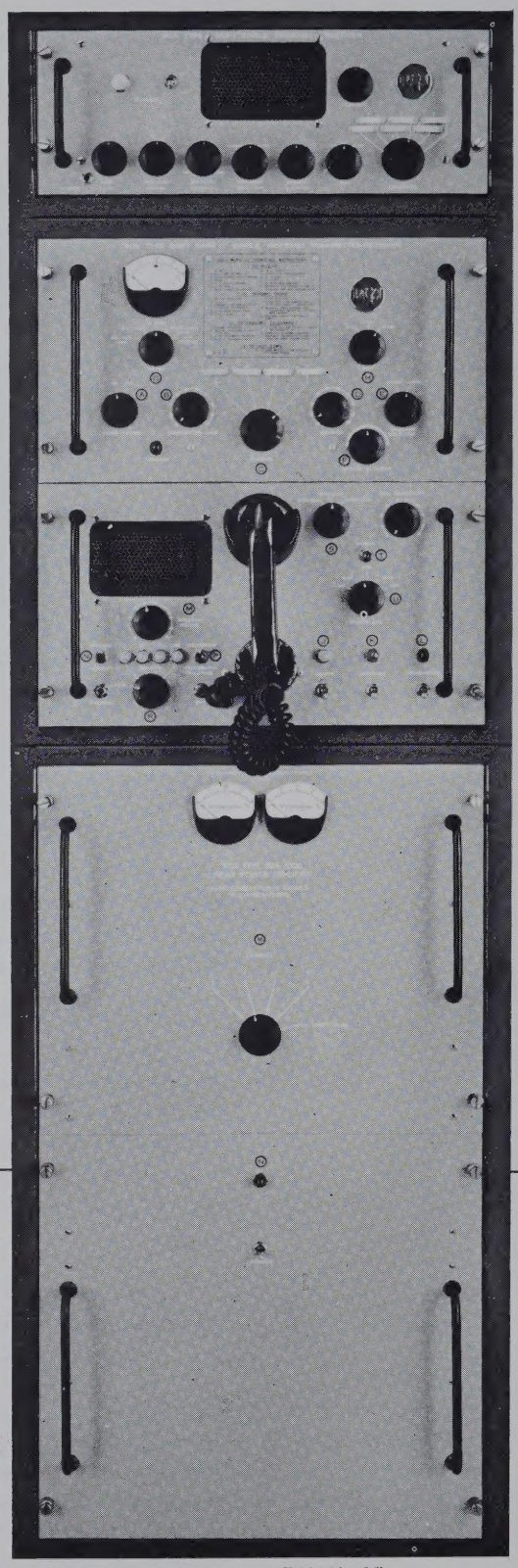


Fig. 75—SSB-1 Mark IV, SBA-1000 Linear Power Amplifier and SBR-1 Receiver installation for High Power full duplex operation. See figure 79

Section VIII
SYSTEM APPLICATIONS

INTRODUCTION

The SSB-1 Mark IV equipment is engineered for many system applications. The design of the transmitter and receiver permit other communication equipment to be connected directly to the SSB-1 Mk. IV terminal boards at the rear of the equipment.

Up to three remote telephone desk sets may be connected to the SSB-1 Mk. IV. Remote control of the transmitter is possible from any one of these remote telephones. Signalling circuits are provided at the remote location as well as at the transmitter. This arrangement allows the local operator to call a remote station, or be called, by sounding a buzzer. A built-in loudspeaker is used for standby calls and monitoring when the transmitter is turned off.

A separate 600 ohm audio output of the SSB-1 Mk. IV receiver is terminated at terminal board TB104 for connection to auxiliary equipment. Other terminals of TB104 provide a 600 ohm input to the transmitter. The use of 600 ohm input and output connections makes it possible to connect telephone and other communication equipment to the SSB-1 Mk. IV in many system applications.

When the SSB-1 Mk. IV is used for simplex service, the receiver is muted during transmission due to the removal of B-plus to many sections of the receiver. In a system employing another receiver, muting may be accomplished by a simple terminal board connection from the Mk. IV transmitter to the squelch circuit of the other receiver such as the RCA type SBR-1.

SIMPLEX TELEPHONE SYSTEM

In a simplex (push-to-talk) telephone system, transmission and reception are on the same frequency. In this system the receiver is muted during transmission making simultaneous reception and transmission impossible. A telephone conversation is limited in simplex operation because both parties are required to "take turns" transmitting. The party transmitting cannot hear the other party, or be interrupted, until the push-to-talk button is released.

The RCA type VOK-10 voice-operated relay greatly increases the operating flexibility of the SSB-1 Mk. IV in system applications. The VOK-10 is a plug-in accessary unit designed for the SSB-1 Mk. IV permitting limited duplex operation without an additional receiver. The voice-operated relay automatically places the transmitter "on the air" when the operator begins speaking. During a pause in transmission, the VOK-10 automatically switches the Mk. IV to the receive condition giving the other party the opportunity to be heard. Using a voice-operated changeover relay does not require the use of the push-to-talk button and transmission and reception approaches the convenience of a normal telephone conversation.

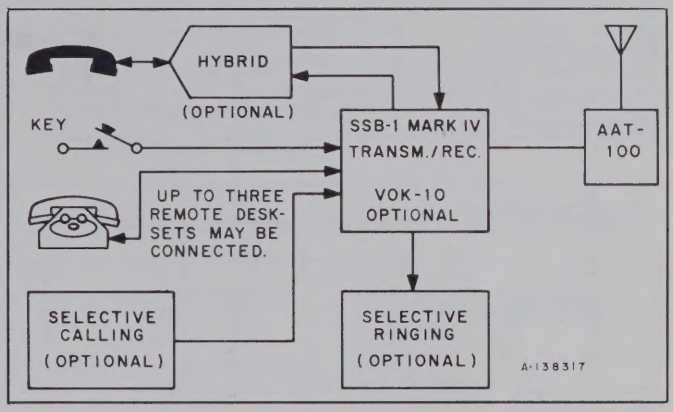


Fig. 76—Simplex Telephone System

RCA hybrid telephone equipment may be employed in a simplex telephone system for connecting a telephone exchange to the SSB-1 Mk. IV. The hybrid extends the usefulness of the Mk. IV to any remote telephone through the telephone land lines.

The VOK-10 unit is very desirable when hybrid telephone equipment is used because common telephone handsets are not equipped with a push-to-talk button. If the VOK-10 unit is not used, a local operator must monitor the transmissions and switch the Mk. IV from transmit to receive as desired. A telegraph key or other switch may be used to switch the transmitter "on" during telephone transmissions coming in on the hybrid line. Be sure the TELEPHONE/TELEGRAPH switch is in the TELEPHONE position.

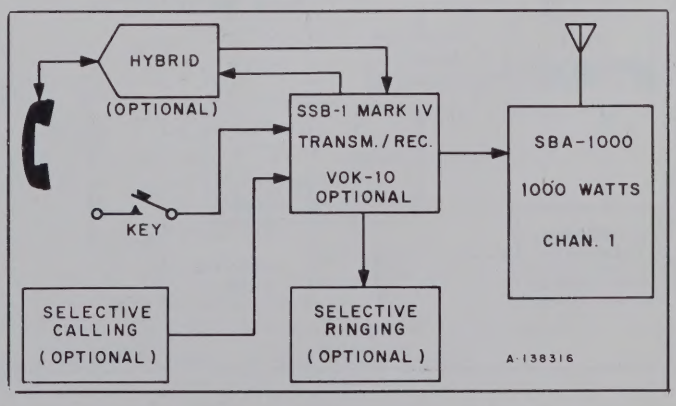


Fig. 77—Simplex Telephone System, High Power

DUPLEX TELEPHONE SYSTEM

A duplex telephone system permits simultaneous two-way transmission and reception. To make duplex operation possible, an SBR-1 receiver is used to receive on one frequency while the SSB-1 Mk. IV is transmitting on another frequency. The frequencies selected should differ by at least 50 kc. This separation of channels is necessary to prevent interference in the SBR-1 receiver.

NOTE:—In many instances inadequate precaution against high standing waves on the transmitting antenna feeder system can cause receiver interference even though adequate channel separation is employed. To insure proper operation check transmitter antenna tuning to obtain a VSWR of less than 2:1.

When using other receivers, carefully investigate the blocking characteristics of the circuitry to determine minimum channel separation.

For duplex operation, the SSB-1 Mk. IV must be keyed "on" at all times. This may be done by installing a single-pole single-throw switch between terminal #7, TB104 (marked RX) and terminal 9 (marked GROUND), TB104. Closing the switch will place the transmitter in the "transmit" position. This condition will remain until the switch is opened.

For greater flexibility, selective calling and ringing equipment and telephone hybrid equipment may be incorporated as shown in the block diagrams below.

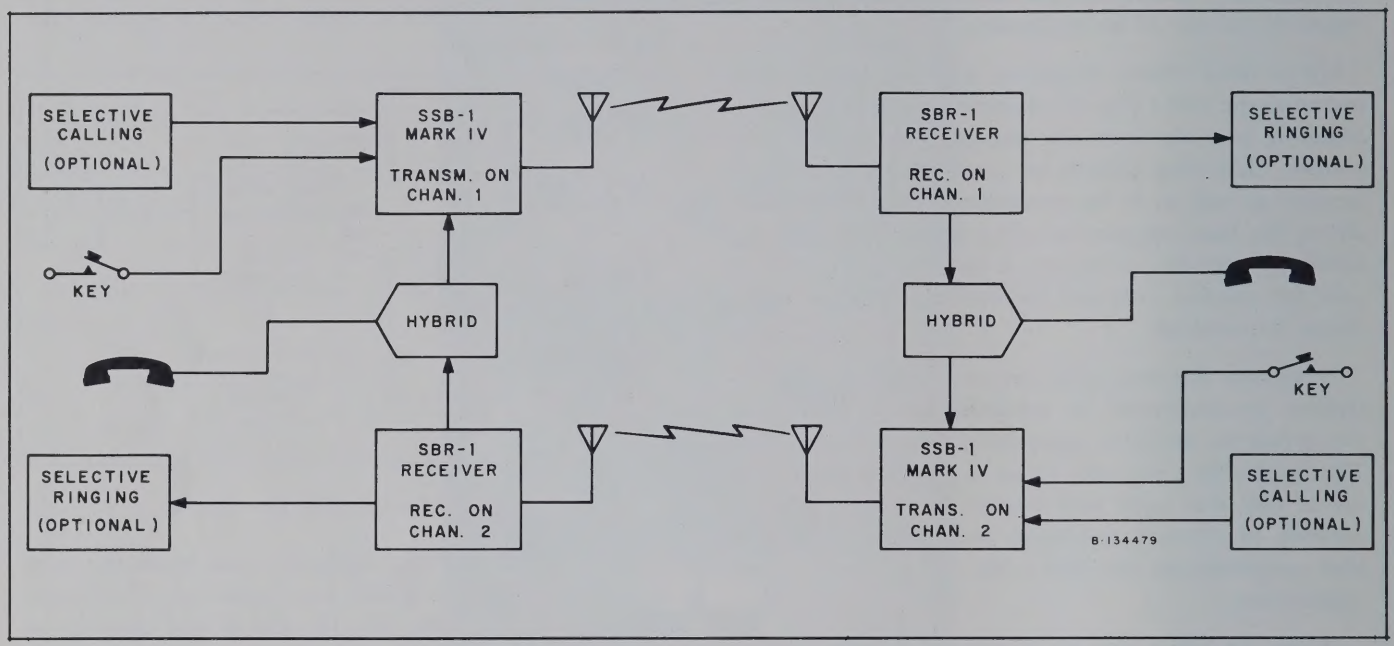


Fig. 78—Full Duplex Telephone System

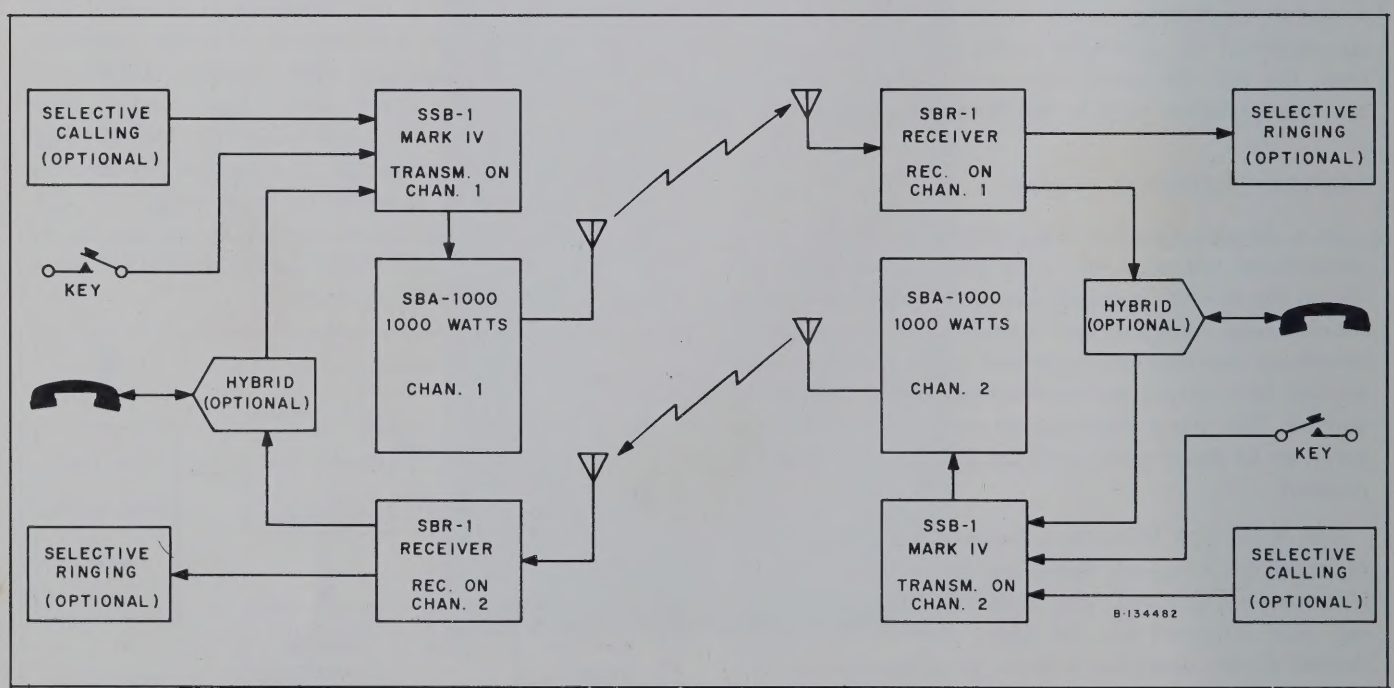


Fig. 79—Full Duplex Telephone System, High Power

HAND TELEGRAPHY AND TELEPRINTERS

The SSB-1 Mark IV is readily adaptable to the transmission of either teleprinter or hand telegraph signals. A self-generated keyed tone signal is always employed for the transmission of hand keyed telegraph signals. Either the self-generated keyed tone or audio frequency shift may be used for the transmission of teleprinter signals. When the self-generated keyed tone is employed the received tone must be converted to direct current by tone-signal conversion equipment (similar to the RCA type CTC-1) for operation of the teleprinter. When audio frequency shift is employed, AFS transmitters and receivers must be properly connected to the transmitting and receiving equipment and teleprinters. Figures 80(a) and 80(b) show proper connections for both "keyed tone" and audio frequency shift teleprinter operation.

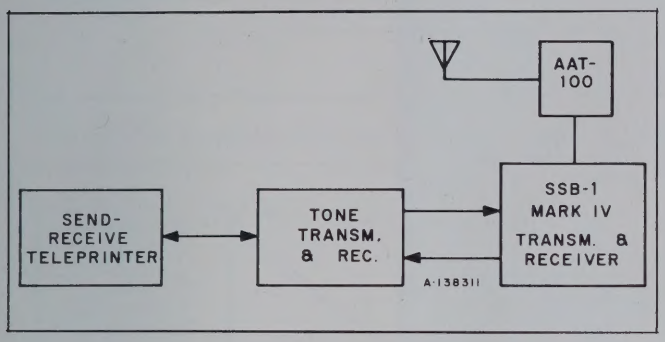


Fig. 80—Simplex Teleprinter or Telegraph System

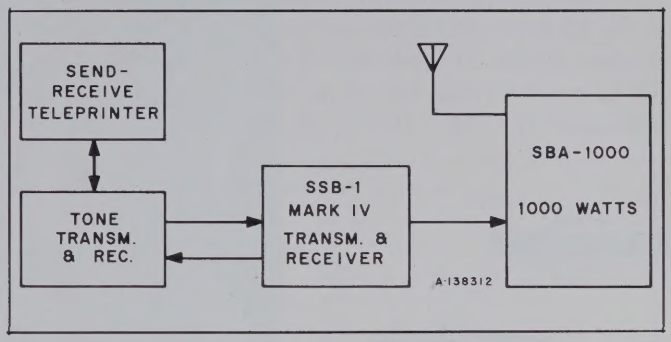


Fig. 81—Simplex Teleprinter or Telegraph System, High Power

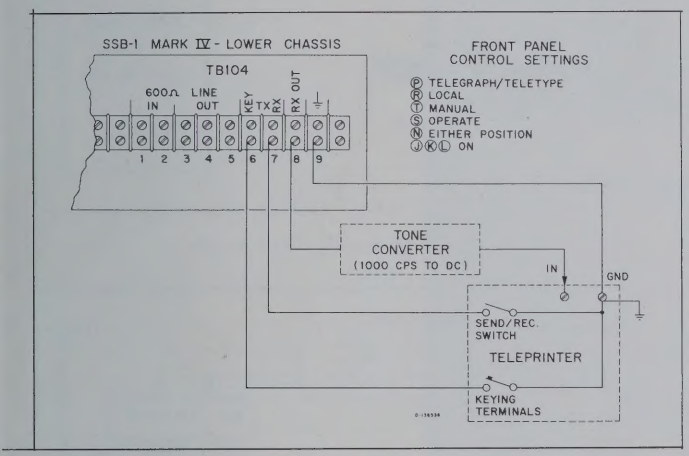


Fig. 80(a)—Connections and front panel control settings— "ON-OFF" Teleprinter System

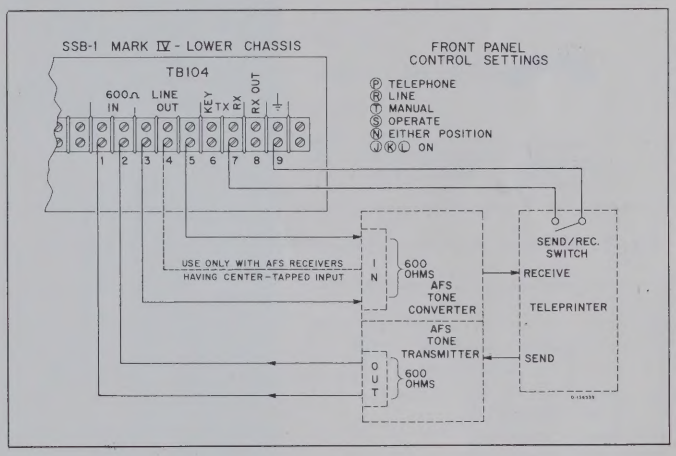


Fig. 80(b)—Connections and front panel control settings— Audio Frequency Shift Teleprinter System

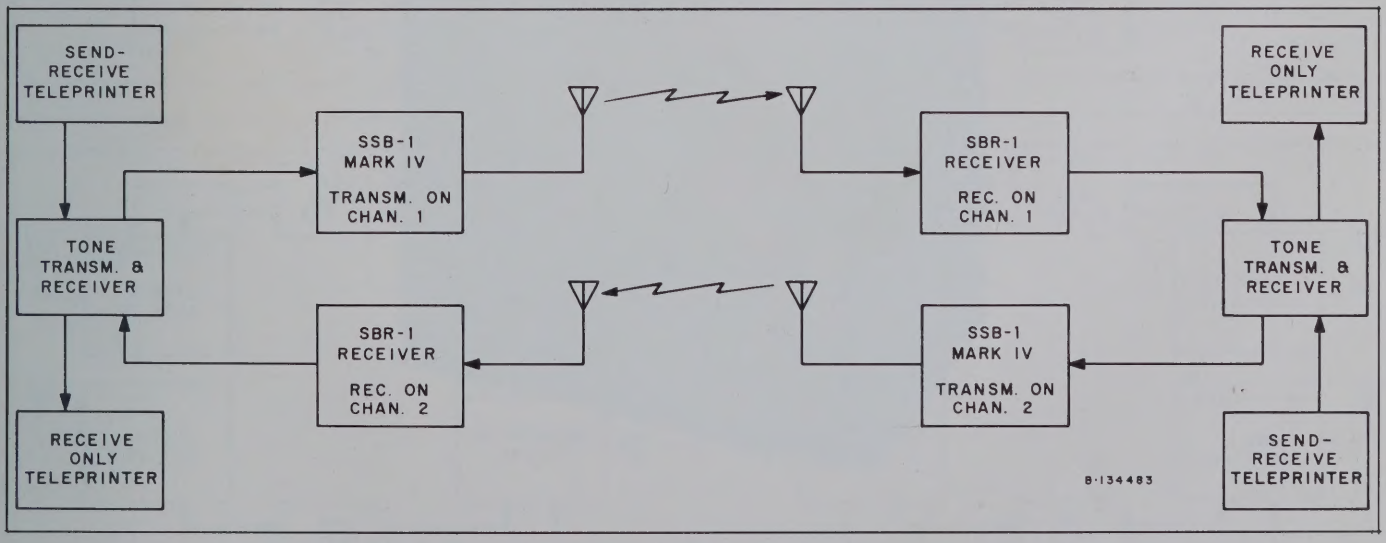

SEND-RECEIVE TELEPRINTER
TONE TRANSM. & RECEIVER
RECEIVE ONLY TELEPRINTER
SSB-1 MARK IV TRANSM. ON CHAN. 1
SBR-1 RECEIVER REC. ON CHAN. 1
SBR-1 RECEIVER REC. ON CHAN. 2
SSB-1 MARK IV TRANSM. ON CHAN. 2
TONE TRANSM. & RECEIVER
RECEIVE ONLY TELEPRINTER
SEND-RECEIVE TELEPRINTER
B-134483

Fig. 82—Full Duplex Teleprinter System. Addition of SBA-1000 converts system to High Power, see figure 79.

MOBILE AND MICROWAVE SYSTEMS

Mobile systems can be tied together with one or more SSB-1 Mk. IV units. The base station can use one channel to contact all mobile units or up to eight separate channels (utilizing upper and lower sidebands) may be used for larger mobile systems.

The SSB-1 Mk. IV may also be used in conjunction with microwave equipment. Microwave equipment such as the MM600 or CTR-900 can provide a radio relay link between remote locations where a telephone line might not be possible. Each end of the microwave relay can be terminated in a SSB-1 Mk. IV for long distance relaying.

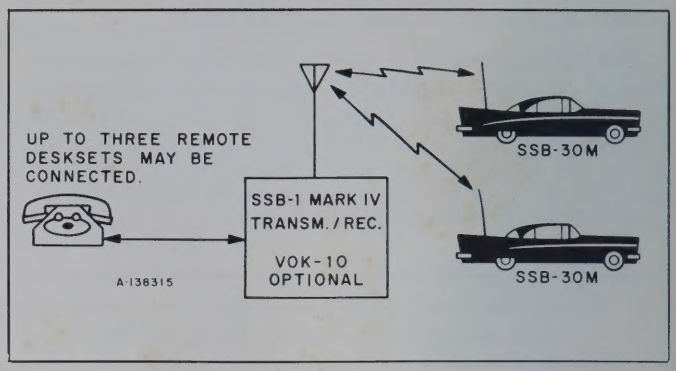


Fig. 83—Base to mobile system, both mobiles in same channel.

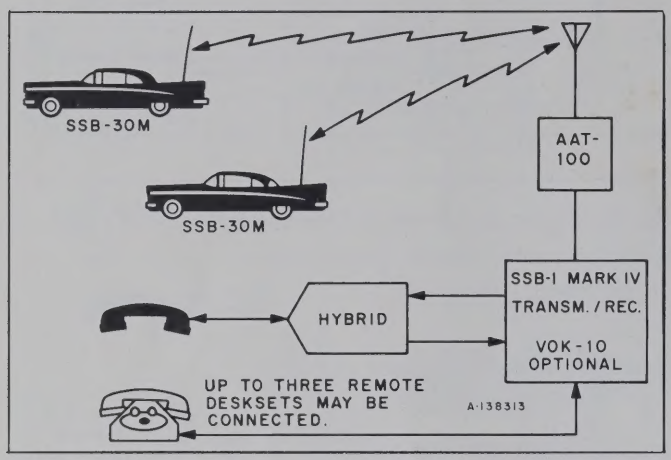


Fig. 84—Base to mobile system, mobiles on different channels

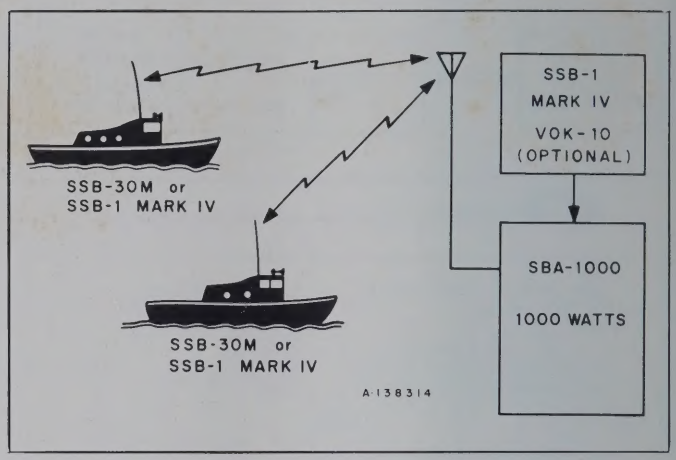


Fig. 85—Base to mobile, high power

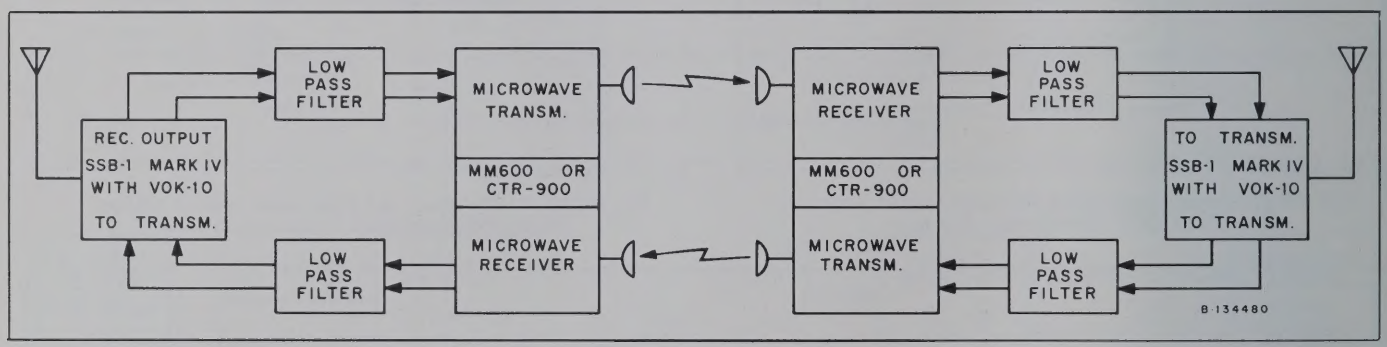


Fig. 86—Microwave Relay System, Simplex Operation

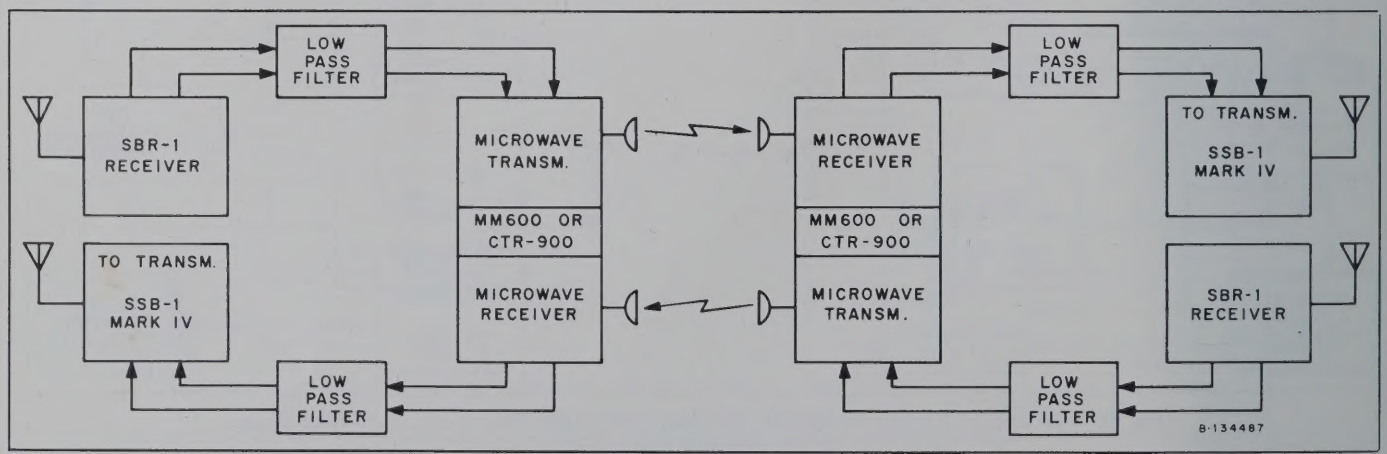


Fig. 87—Microwave Relay System, Full Duplex Operation

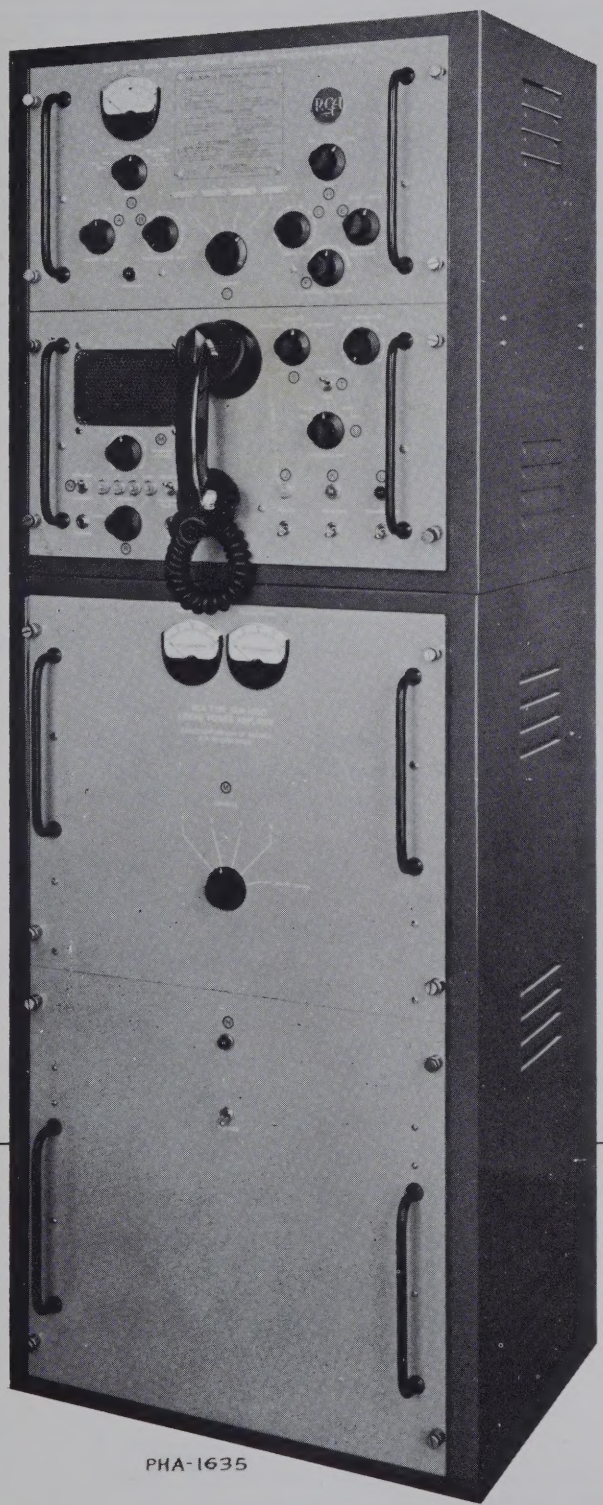


Fig. 88—SSB-1 Mark IV used with SBA-1000 Linear Power Amplifier as shown in figure 77

DIRECTIONS – Identify similar component type in the proper column on the lower section of the page. Read across the rows at the top to determine the significance or value of the various colors.

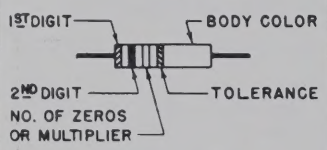
COLOR	DIGITS OR NO. OF ZEROS	RESISTORS RMA & JAN		CAPACITORS MOLDED MICA RMA & JAN			CAPACITORS MOLDED PAPER		CAPACITORS CERAMIC RMA & JAN				DIGITS OR NO. OF ZEROS	COLOR
		MULTIPLIER	TOLERANCE	MULTIPLIER	TOLERANCE	CLASS OR CHARACTERISTIC	MULTIPLIER	TOLERANCE	MULTIPLIER	TOLERANCE C>10 μμf	TOLERANCE C≤10 μμf	TEMP. COEFF. PTS. / MIL. / °C.		
BLACK	0	1		1	20%	A	1	20%	1	20%	2.0	0	0	BLACK
BROWN	1	10		10		B	10		10	1%		-30	1	BROWN
RED	2	100		100	2%	C	100		100	2%		-80	2	RED
ORANGE	3	1000		1000	3% (RMA)	D	1000		1000	2.5% (RMA)		-150	3	ORANGE
YELLOW	4	10000		10000		E	10000	5%	10000 (RMA)			-220	4	YELLOW
GREEN	5	10^5			5% (RMA)	F (JAN)				5%	0.5	-330	5	GREEN
BLUE	6	10^6				G (JAN)						-470	6	BLUE
VIOLET	7	10^7										-750	7	VIOLET
GRAY	8	10^8				I (RMA)			.01		0.25	+30	8	GRAY
WHITE	9	10^9				J (RMA)		10%	.1	10%	1.0	-330 ± 500 JAN; +120 - 750 RMA	9	WHITE
GOLD		.1	5%		5% (JAN)		.1	5%						GOLD.
SILVER		.01	10%		10%			10%						SILVER
NO COLOR			20%					20%						NO COLOR

RESISTORS

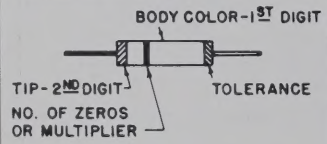
RMA & JAN COLOR CODING FOR FIXED COMPOSITION RESISTORS ARE IDENTICAL.
COLOR CODE GIVES THE RESISTANCE IN OHMS.

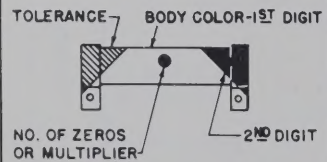
COLOR BAND SYSTEM

RESISTORS WITH BLACK BODY COLOR ARE COMPOSITION, NON-INSULATED.
RESISTORS WITH COLORED BODIES ARE COMPOSITION, INSULATED.
WIRE-WOUND RESISTORS HAVE THE 1ST DIGIT COLOR BAND DOUBLE WIDTH.



BODY, TIP, DOT OR NARROW BAND SYSTEM



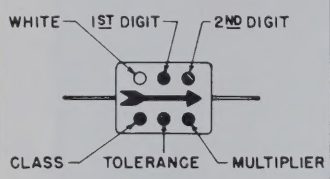


EXAMPLE –
BROWN-GREEN-RED = 1500 Ω ± 20%

CAPACITORS, MOLD. MICA

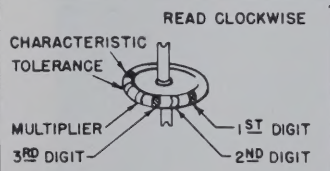
ALL AXIAL LEAD MICA CAPACITORS HAVE A VOLTAGE RATING OF 300 TO 500 VOLTS. THE MAXIMUM CAPACITY OBTAINABLE IS 10,000 μμf.
THE COLOR CODE GIVES THE CAPACITY IN μμf.

RMA 6 DOT SYSTEM

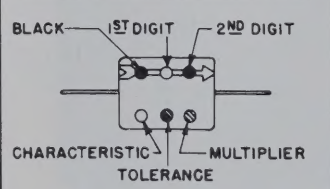


CLASS WAS PREVIOUSLY VOLTAGE.

BUTTON SILVER MICA



JAN 6 DOT SYSTEM

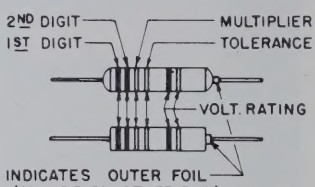


EXAMPLE – RMA 6 DOT
WHITE-ORANGE-BLUE } 360 μμf ± 2%
WHITE – RED – BROWN } CLASS J

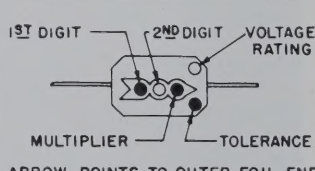
CAPACITORS, MOLD. PAPER

VOLTAGE RATINGS IN HUNDREDS OF VOLTS. ONE COLOR BAND EMPLOYED FOR RATINGS UNDER 1000 VOLTS.
THE COLOR CODE GIVES THE CAPACITY IN μμf.

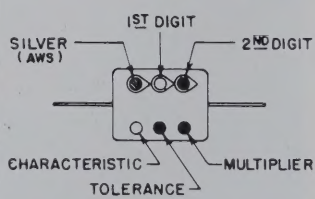
BAND SYSTEM



DOT SYSTEM



ARROW POINTS TO OUTER FOIL END

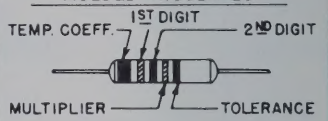


EXAMPLE –
RED-GREEN-ORANGE-BLACK-BROWN-RED
25000 μμf ± 20% 1200 Volts

CAPACITORS, CERAMIC

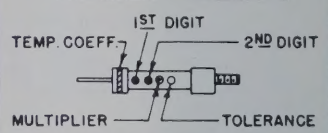
ALL TUBULAR CERAMIC CAPACITORS ARE RATED AT 500 VOLTS.
THE COLOR CODE GIVES THE CAPACITY IN μμf.

MOLDED INSULATED

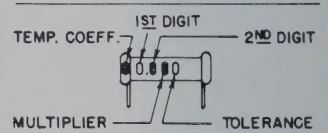


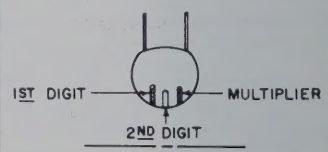
NOTE – DO NOT CONFUSE WITH RESISTORS. FIVE COLOR BANDS USED, (ONE BROAD, FOUR NARROW), WHILE RESISTORS USE FOUR BANDS.

STANDOFF CERAMIC

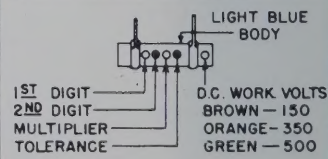


DIPPED PHENOLIC INSULATED OR NON-INSULATED





HI-CAPACITY CERAMIC TYPE (NOT TEMPERATURE COMPENSATED)



EXAMPLE –
BROWN-BLACK-ORANGE = 10000 μμf

MSA-2993

Section IX

PARTS

INTRODUCTION

The information in this section is included to expedite the procurement of spare or replacement parts. All parts can be ordered from the Radio Corporation of America, RCA International Division, Parts Marketing Department, Central and Terminal Avenues, Clark, New Jersey, U.S.A. Include all information listed for the required parts and specify that the parts are for use in the SSB-1 Mark IV. The symbol numbers correspond to the designations in the schematic diagrams and illustrations.

SYMBOL PREFIXES (Alphabetical)

PREFIX	PARTS CLASS
C	Capacitor
CR	Crystal diode
DS	Indicator; illuminating or indicating device (other than a meter or counter)
E	Crystal oven
F	Fuse
FL	Filter
J	Electrical connector (with male, female, or male and female contacts and designed to be mounted on a chassis or panel); jack; receptacle
K	Relay (electrically operated contactor or switch)
L	Choke; inductor; loading coil; tuning coil
M	Meter or counter (indicating device)
MP	Miscellaneous mechanical part
P	Electrical connector (with male, female, or made anl female contacts and designed to be affixed to the end of a cable, coaxial line, cord, or wire); plug
R	Resistor, fixed or variable; potentiometer; rheostat
S	Switch (mechanically or thermally operated); interlock
T	Transformer (power, audio, IF, or RF); autotransformer
TB	Terminal board
V	Electron tube
W	Cable; coaxial cable; wire
X	Socket; fuseholder; lampholder (designation of associated part follows the X)
Y	Oscillator (piezo-electric crystal)

PARTS LIST

SSB-1 MARK IV TRANSMITTER/RECEIVER SECTION

SYMBOL NO.	STOCK NO.	DESCRIPTION
		CAPACITORS
C201	71-31053	Capacitor—Variable mica, 1400-3055 mmf., 250 v., Elmenco type 315 (channel 1, PA loading)
C202		Same as C201 (channel 2, PA loading)
C203	71-31054	Capacitor—Variable mica, 340-1070 mmf., 250 v., Elmenco type 307M (channel 3, PA loading)
C204		Same as C203 (channel 4, PA loading)
C205	71-31055	Capacitor—Variable air, 12-250 mmf., 1500 v., Bud type CE-2007 (channel 4, PA tuning)
C206		Same as C205 (channel 3, PA tuning)
C207		Same as C205 (channel 2, PA tuning)
C208		Same as C205 (channel 1, PA tuning)
C209	71-31000	Capacitor—Mica, 100 mmf., ±10%, 2500 v. (channel 1, PA tuning, padder)
C210		Same as C210 (channel 2, PA tuning, padder)
C211	71-31098	Capacitor—Disc ceramic, 1000 mmf., ±20%, 1500 v., Erie type 125 KV-102 (output coupling)
C212		Same as C211 (750 v. B-plus bypass)
C213	71-31019	Capacitor—Disc ceramic, 0.01 mf., —0% +100%, 500 v. (V201, screen bypass)
C214		Same as C213 (V202, screen bypass)
C215		Same as C213 (V203, screen bypass)
C216	71-31114	Capacitor—Ceramic, 3mmf., ±10%, 5000 v., NPO, Centralab type 855-3Z (PA neutralizing)
C217	71-31020	Capacitor—Disc ceramic, 470 mmf., ±20%, 500 v. (V204, coupling)
C218		Same as C213 (PA, grid bypass)
C219		Not used
C220	71-30951	Capacitor—Variable ceramic, 20-125 mmf., Centralab type CRL-823-AN (PA neutralizing)
C221	71-31115	Capacitor—Mica, 270 mmf., ±10%, 300 v. (IPA, tuning, padder)
C222		Same as C213 (V205, R-F bypass, 150 v. reg. DC)
C223	71-30994	Capacitor—Mica, 1000 mmf., ±10%, 300 v. (V205, IPA coupling)
C224		Same as C213 (V205, screen bypass)
C225		Same as C213
C226		Same as C213 (V205, cathode bypass)
C227		Same as C213 (bal. mod. tuning ind. bypass)
C228		Same as C213 (V206, screen bypass)
C229	71-30998	Capacitor—Mica, 2200 mmf., ±10%, 500 v. (V206, output coupling)
C230		Same as C213 (V206, cathode bypass)
C231		Same as C213 (V207, plate bypass)
C232	71-30944	Capacitor—Variable air, 6.7-140 mmf., 600 v., Hammerlund type APC-140 (V207, plate, channel 1 tuning)
C233		Same as C232 (V207, plate, channel 2 tuning)
C234		Same as C232 (V207, plate, channel 3 tuning)
C235		Same as C232 (V207, plate, channel 4 tuning)
C236		Same as C213 (V207, cathode bypass)
C237	71-30988	Capacitor—Mica, 22 mmf., ±10%, 500 v. (V207, grid coupling)
C238		Same as C237 (V207, grid coupling)
C239	71-30966	Capacitor—Variable air trimmer, 4-34 mmf., Rogers Majestic Cat. CD11 (V208, balance adj.)
C240		Same as C237 (V208, plate tuning)
C241		Same as C213 (V208, plate bypass)
C242	71-30991	Capacitor—Mica, 330 mmf., ±10%, 500 v. (V312, output coupling)
C243	71-31105	Capacitor—Variable ceramic, 1.5-7 mmf., 500 v Erie TS2A-1.5 (carrier level control)
C244	71-31011	Capacitor—Disc ceramic, 0.01 mf., ±20%, 500 v. (V218, grid coupling)
C245		Same as C220 (FL201, output tuning)
C246	71-30996	Capacitor—Mica, 360 mmf., ±2%, 500 v. (FL201, output tuning)
C247		Same as C246 (FL201, input tuning)
C248		Same as C220 (FL201, input tuning)
C249		Same as C244 (V209, output coupling)
C250		Same as C244 (V209, output coupling)
C251		Same as C237 (FL201, input tuning)
C252		Same as C213 (V209, plate bypass)
C253		Same as C244 (V217, output coupling)
C254		Same as C244 (V217, output coupling)
C255		Same as C213 (V217, plate bypass)
C256		Same as C239 (FL201, input tuning and balance)
C257		Same as C213 (V209, cathode bypass)
C258		Same as C213 (V217, cathode bypass)
C259		Same as C244 (V210, output coupling)
C260		Same as C244 (V210, output coupling)
C261		Same as C213 (meter bypass)
C262	71-31005	Capacitor—Ceramic disc, 0.01 mf., ±20%, 1200 v. DC (PA plate bypass)
C263	71-30990	Capacitor—Mica, 100 mmf., ±10%, 500 v. (V209, input bypass)
C264		Same as C263 (V209, input bypass)
C265		Same as C213 (V208, cathode bypass)
C266		Same as C217 (IPA, meter coupling)

PARTS LIST—Continued

SSB-1 MARK IV TRANSMITTER/RECEIVER SECTION

SYMBOL NO.	STOCK NO.	DESCRIPTION
C267		Same as C213 (V210, audio coupling)
C301		Capacitor—Ceramic, 51 mmf., 500 v., N220 (Part of L203 assy.) (V214, grid tuning, channel 1)
C302		Same as C301 (Part of L204 assy.) (V214, grid tuning, channel 2)
C303		Capacitor—Ceramic, 30 mmf., 500 v., N220 (Part of L205 assy.) (V214, grid tuning, channel 3)
C304		Same as C303 (Part of L206 assy.) (V214, grid tuning, channel 4)
C305		Same as C213 (V214, AGC bypass)
C306	71-30987	Capacitor—Mica, 15 mmf., ±10%, 500 v. (V214, grid tuning)
C307		Same as C213 (V214, cathode bypass)
C308		Same as C213 (V214, screen bypass)
C309		Same as C301 (Part of L207 assy.) (V214, plate tuning, channel 1)
C310		Same as C301 (Part of L208 assy.) (V214, plate tuning, channel 2)
C311		Same as C303 (Part of L209 assy.) (V214, plate tuning, channel 3)
C312		Same as C303 (Part of L210 assy.) (V214, plate tuning, channel 4)
C313	71-30962	Capacitor—Disc ceramic, 0.02 mf., +80% —20%, 500 v. (V214, plate bypass)
C314	71-30918	Capacitor—Ceramic, 100 mmf., ±10%, 500 v. (V215, grid coupling)
C315		Same as C213 (V215, AGC bypass)
C316	71-31106	Capacitor—Variable air, 2.3-14 mmf., Johnson type 15 M11 (Y204, tuning)
C317		Same as C316 (Y203, tuning)
C318	71-30995	Capacitor—Mica, 510 mmf., ±5%, 500 v. (V211, grid tuning, channel 3)
C319		Same as C318 (V211, grid tuning, channel 4)
C320	71-30997	Capacitor—Mica, 1200 mmf., ±10%, 500 v. (V211, grid tuning, channel 2)
C321		Same as C316 (Y202, tuning)
C322		Same as C316 (Y201, tuning)
C323		Same as C320 (V211, grid tuning, channel 1)
C324		Same as C244 (V211, screen coupling)
C325		Same as C223 (V211, output coupling)
C326		Same as C242 (V215, grid coupling)
C327		Same as C213 (V211, plate bypass)
C328		Same as C213 (V215, cathode bypass)
C329		Same as C213 (V215, AGC filter)
C330		Same as C213 (V215, screen bypass)
C331		Same as C213 (V215, plate bypass)
C332		Same as C213 (V216, AGC filter)
C333	71-30964	Capacitor—Disc ceramic, 0.05 mf., +80%, —20%, 500 v. (V216, AGC filter)
C334	71-30917	Capacitor—Ceramic, 27 mmf., ±10%, 500 v. (V216, grid coupling)
C335		Same as C213 (V312, screen bypass)
C336		Same as C213 (V216, cathode bypass)
C337		Same as C213 (V216, screen bypass)
C338		Same as C213 (V312, plate bypass)
C339		Same as C223 (V312, grid coupling)
C340	71-31001	Capacitor—Mica, 220 mmf., ±10%, 500 v. (V312, grid tuning)
C341	71-31107	Capacitor—Variable air, 6-50 mmf., Bud MC-903 (V312, speech clarifier)
C342		Same as C213 (V216, plate bypass)
C343	71-31108	Capacitor—Variable ceramic, 4-30 mmf., 500 v., Erie TS2A-4 (Y205, tuning)
C344		Same as C343 (Y206, tuning)
C345	71-31021	Capacitor—Disc ceramic, 1000 mmf., ±20%, 500 v. (Y207, tuning)
C346		Same as C239 (Y207, tuning)
C347		Same as C213 (V218, AGC filter)
C348		Same as C244 (V213, xtal coupling)
C349		Same as C213 (V218, cathode bypass)
C350		Same as C213 (V213, xtal coupling)
C351		Same as C213 (V213, screen bypass)
C352		Same as C213 (V218, screen bypass)
C353		Same as C213 (V218, plate bypass)
C354	71-30993	Capacitor—Mica, 470 mmf., ±10%, 500 v. (V220, grid coupling)
C355		Same as C333 (V220, cathode bypass)
C356		Same as C333 (V219, cathode bypass)
C357		Same as C213 (V219, AGC filter)
C358		Same as C213 (V220, plate bypass)
C359		Same as C213 (V220, screen bypass)
C360		Same as C213 (V219, screen bypass)
C361		Same as C213 (V213, output coupling)
C362		Same as C213 (V219, plate bypass)
C363		Same as C263 (V221, demod. filter)
C364		Same as C263 (V221, demod. filter)
C365	71-31081	Capacitor—Electrolytic, 2 mf., +20% —10%, 100 v. (AGC "slow" capacitor—S205)
C366		Same as C213 (AGC filter, S205)
C367		Not used

PARTS LIST—Continued

SSB-1 MARK IV TRANSMITTER/RECEIVER SECTION

SYMBOL NO.	STOCK NO.	DESCRIPTION
C368		Not used
C369		Not used
C370		Same as C213 (V222, squelch diode input)
C371		Same as C213 (V222, AGC diode input)
C372	71-31018	Capacitor — Disc ceramic, 0.0047 mf., +100% —0%, 500 v. (V223, grid coupling)
C373		Same as C340 (V221, demod. filter)
C374		Same as C372 (V223, squelch triode filter)
C375		Same as C345 (V223, A-F ampl. output filter)
C376		Same as C213 (V223, A-F ampl. output coupling)
C377		Same as C213 (V222, AGC diode, cathode bypass)
C378		Same as C333 (V222, squelch diode, cathode bypass)
C379	71-30919	Capacitor — Electrolytic, 20 mf., +50% —10%, 450 v. (V223, squelch triode, bypass)
C380		Same as C213 (V223, squelch triode, bypass)
C381	71-30963	Capacitor—Disc ceramic, 0.04 mf., +80% —20%, 500 v. (V223, squelch triode, grid bypass)
C382		Same as C381 (V223, squelch triode, grid bypass)
C383		Same as C333 (E201, thermostat bypass)
C384		Same as C333 (E202, thermostat bypass)
C385		Same as C333 (E203, thermostat bypass)
		CRYSTAL DIODES
CR201	71-31049	Diode—Germanium, RCA type 1N34A (meter rectifier, IPA tuning)
CR202		Same as CR201 (V211, output level equalizer)
CR203		Same as CR201 (V211, output level equalizer)
CR204	71-31049	Diode—Silicon, 1N2070, Texas Instrument #904, or equivalent, (Noise Limiter)
CR205		Same as CR204
CR206		Same as CR204
CR207		Same as CR204
		LAMPS
DS201	71-31043	Dial Light—Neon, red, incl. mounting nut, omniflow, type 1010A1 (on indicator)
		FILTER
FL201		Mechanical Filter—RCA type MFU250-A1, 3 kc. BW at 6 db. center frequency 251.8 kc.
		RELAYS
K201	71-31084	Relay—DPDT contacts, Coil 5000 ohms, 85 v. DC, Advance, type 3868Y. (antenna changeover and B-plus switching)
K202		Same as K201 (external muting and transmitter cut-off)
		INDUCTANCES
L201	71-31085	Inductance, 22 microhenries (antenna coupling)
L202	71-31086	Inductance, 12 microhenries (PA tuning)
L203	71-30971	Inductor, channel 1 (R-F ampl. grid)
L204		Same as L203, channel 2 (R-F ampl. grid)
L205	71-30972	Inductor, channel 3 (R-F ampl. grid)
L206		Same as L205, channel 4 (R-F ampl. grid)
L207	71-30974	Inductor, channel 1 (214 Plate)
L208		Same as L207, channel 2 (V214 Plate)
L209	71-30975	Inductor, channel 3 (V214 Plate)
L210		Same as L209, channel 4 (V214 Plate)
L211	71-31072	Inductance, 155 microhenries (PA Plate Choke)
L212	71-31074	Inductance, 1.5-7.5 microhenries, channel 4 (IPA Plate, V205)
L213		Same as L212, channel 3 (IPA Plate, V205)
L214	71-31075	Inductance, 7.5-37.5 microhenries, channel 2 (IPA Plate, V205)
L215		Same as L214, channel 1 (IPA Plate, V205)
L216	71-31080	Inductance, 1.0 millihenry, National type R50 (IPA Plate choke, V205)
L217	71-31056	Inductance (PA Plate Suppressor, V201)
L218		Same as L217 (V202)
L219		Same as L217 (V203)
L220		Not used
L221	71-31087	Inductance, 5 microhenries, with 0.5 microhenry link (V207, output tuning)
L222	71-31073	Inductance, 22 microhenries, with 6 microhenry link (V207, output tuning)
L223		Same as L216 (V211, screen R-F choke)
L224	71-30870	Inductance, 1.25 microhenry (V211, screen)
M201	71-31113	Meter, 0-200 microamperes
		RESISTORS
R201	71-30911	Resistor—Composition, 47,000 ohms, ±10%, 1 watt (static discharge resistor)
R202	71-31116	Resistor—Wire wound, 0.21 ohms, ±2%, 2 watts (meter shunt, PA tuning)
R203	71-31117	Resistor—Composition, 68 ohms, ±10%, 1 watt (PA plate parasitic suppressor, V201)
R204		Same as R203 (PA plate parasitic suppressor, V202)
R205		Same as R203 (PA plate parasitic suppressor, V203)
R206	71-30883	Resistor—Composition, 15,000 ohms, ±10%, ½ watt (V204, series resistor)
R207	71-30892	Resistor — Composition, 220,000 ohms, ±10%, ½ watt (V204, series resistor)
R208	71-30905	Resistor—Composition, 4700 ohms, ±10%, 1 watt (PA grid parasitic suppressor)
R209	71-30877	Resistor—Composition, 1000 ohms, ±10%, ½ watt (L220, swamping resistor)
R210	71-30906	Resistor—Composition, 8200 ohms, ±10%, 1 watt (V205, screen dropping)
R211	71-31088	Resistor—Composition, 150 ohms, ±10%, 1 watt (V205, cathode)
R212	71-31118	Resistor—Composition, 12,000 ohms, ±10%, ½ watt
R213	71-30907	Resistor—Composition, 10,000 ohms, ±10%, 1 watt (V205, grid)

PARTS LIST—Continued

SSB-1 MARK IV TRANSMITTER/RECEIVER SECTION

SYMBOL NO.	STOCK NO.	DESCRIPTION
R214		Same as R210 (V206, screen dropping)
R215	71-30903	Resistor—Composition, 820 ohms, ±10%, 1 watt (V206, plate load)
R216		Same as R211 (V206, cathode)
R217	71-30882	Resistor—Composition, 10,000 ohms, ±10%, ½ watt (V206, grid)
R218		Same as R217 (V208, cathode)
R219		Same as R213 (V207, plate load)
R220	71-31089	Resistor—Composition, 750 ohms, ±5%, ½ watt (V206, grid input)
R221	71-30895	Resistor — Composition, 470,000 ohms, ±10%, ½ watt (V207, grid)
R222		Same as R221 (V207, grid)
R223		Same as R209 (V207, cathode)
R224	71-31109	Resistor—Variable, 50,000 ohms, ½ watt. Linear taper, Mallory LC50MP, (V208, balance control)
R225		Same as R213 (V208, plate series)
R226	71-30929	Resistor—Composition, 47,000 ohms, ±10%, 2 watt (V208, cathode series)
R227		Same as R226 (V208, cathode series)
R228	71-30887	Resistor—Composition, 47,000 ohms, ±10%, ½ watt (V208, grid)
R229		Same as R228 (V208, grid)
R230	71-30889	Resistor — Composition, 100,000 ohms, ±10%, ½ watt (V208, grid)
R231		Same as R228 (filter output series resistor)
R232	71-30091	Resistor — Composition, 680,000 ohms, ±10%, ½ watt (carrier in-out resistor)
R233	71-30883	Resistor—Composition, 15,000 ohms, ±10%, ½ watt (V209, plate isolation)
R234		Same as R233 (V209, plate isolation)
R235		Same as R217 (V209, plate decoupling)
R236		Same as R228 (V217, output isolation)
R237		Same as R228 (V217, output isolation)
R238		Same as R217 (V217, plate decoupling)
R239		Same as R228 (V217, plate series)
R240		Same as R228 (217, plate series)
R241	71-30885	Resistor—Composition, 27,000 ohms, ±10%, ½ watt (V209, plate series)
R242	71-31110	Resistor—Variable, 20,000 ohms, ½ watt, Linear Taper, Mallory type LC20MP (V209, balance control)
R243		Same as R241 (V209, plate series)
R244	71-30880	Resistor—Composition, 1800 ohms, ±10%, ½ watt (V209, cathode)
R245		Same as R209 (V217, cathode)
R246		Same as R228 (V217, grid input)
R247		Same as R228 (V217, grid input)
R248	71-30891	Resistor — Composition, 150,000 ohms, ±10%, ½ watt (V209, grid resistor)
R249		Same as R248 (V209, grid resistor)
R250	71-30872	Resistor—Composition, 68,000 ohms, ±10%, ½ watt (V209, grid isolation)
R251	71-30896	Resistor — Composition, 820,000 ohms, ±10%, ½ watt (V209, grid bias)
R252		Same as R251 (V209, grid bias)
R253		Same as R250 (V209, grid isolation)
R254		Same as R228 (V210, plate load)
R255	71-30878	Resistor—Composition, 1200 ohms, ±10%, ½ watt (V210, cathode)
R256		Same as R228 (V210, cathode)
R257	71-31093	Resistor—Variable, 250,000 ohms (V210, gain control)
R258		Same as R248 (DS201, series)
R259		Same as R230 (V210, grid bias)
R301	71-30922	Resistor—Composition, 270 ohms, ±10%, 2 watt (V214, grid)
R302		Same as R230 (V214, AGC isolation)
R303	71-30874	Resistor—Composition, 220 ohms, ±10%, ½ watt (V214, cathode)
R304		Same as R201 (V214, screen dropping)
R305		Same as R213 (V214, plate decoupling)
R306		Same as R230 (V215, AGC)
R307		Same as R221 (V215, AGC)
R308	71-30884	Resistor—Composition, 22,000 ohms, ±10%, ½ watt (V211, grid, chan. 4)
R309		Same as R308 (V211, grid, chan. 3)
R310		Same as R255 (V211, swamping for L224)
R311		Same as R228 (V211, grid, chan. 2)
R312		Same as R228 (V211, grid, chan. 1)
R313	71-30926	Resistor—Composition, 22,000 ohms, ±10%, 2 watt (V211, plate dropping)
R314		Same as R313 (V211, plate dropping)
R315		Same as R228 (V215, grid bias)
R316		Same as R303 (V215, cathode)
R317	71-31010	Resistor—Variable, 5000 ohms, 2 watt, Taper 11, Mallory R5MP (V215, V216, squelch control)
R318	71-30925	Resistor—Composition, 15,000 ohms, ±10%, 2 watt (CR202, CR203, voltage divider)
R319	71-30877	Resistor—Composition, 1000 ohms, ±10%, ½ watt (CR202, CR203, voltage divider)
R320	71-30910	Resistor—Composition, 22,000 ohms, ±10%, 1 watt (V215, screen)
R321		Same as R230 (V215, AGC)
R322	71-30881	Resistor—Composition, 2200 ohms, ±10%, ½ watt (V215, plate decoupling)

PARTS LIST—Continued

SSB-1 MARK IV TRANSMITTER/RECEIVER SECTION

SYMBOL NO.	STOCK NO.	DESCRIPTION
R323		Same as R230 (V216, AGC isolation)
R324		Same as R228 (V216, grid bias)
R325	71-30886	Resistor—Composition, 39,000 ohms, ±10%, ½ watt (V312, screen)
R326	71-30873	Resistor—Composition, 180 ohms, ±10%, ½ watt (V216, cathode)
R327		Same as R210 (V312, plate series)
R328	71-30908	Resistor—Composition, 12,000 ohms, ±10%, 1 watt (V312, plate decoupling)
R329		Same as R320 (V216, screen)
R330		Same as R230 (V312, grid)
R331	71-30897	Resistor—Composition, 1 megohm, ±10%, ½ watt (V312, grid)
R332		Same as R322 (V216, plate decoupling)
R333		Same as R230 (V215, V216, AGC)
R334		Same as R230 (V218, AGC isolation)
R335		Same as R230 (V218, grid)
R336		Same as R303 (V218, cathode)
R337		Same as R331 (V213, grid)
R338		Same as R230 (V213, grid)
R339		Same as R230 (V213, screen)
R340		Same as R210 (V213, plate series)
R341		Same as R228 (V218, screen)
R342		Same as R322 (V218, plate decoupling)
R343		Same as R331 (V219, AGC isolation)
R344		Same as R221 (V219, grid)
R345	71-30888	Resistor—Composition, 82,000 ohms, ±10%, ½ watt (V220, grid)
R346		Same as R322 (V220, plate decoupling)
R347		Same as R303 (V220, cathode)
R348		Same as R209 (V219, cathode)
R349		Same as R228 (V220, screen)
R350		Same as R228 (V219, screen)
R351		Same as R322 (V219, plate decoupling)
R352	71-30891	Resistor — Composition, 150,000 ohms, ±10%, ½ watt (V213, plate)
R353	71-30893	Resistor — Composition, 270,000 ohms, ±10%, ½ watt (V221, demod. filter)
R354		Same as R230 (V221, demod. audio divider)
R355	71-30890	Resistor — Composition, 120,000 ohms, ±10%, ½ watt (V221, demod. audio divider)
R356		Not Used
R357		Not Used
R358		Not Used
R359		Same as R352
R360		Same as R221
R361		Same as R331 (V222, AGC diode, plate)
R362	71-30892	Resistor — Composition, 220,000 ohms, ±10%, ½ watt. (V223, A-F ampl. grid)
R363		Same as R248 (V222, AGC diode, voltage divider)
R364		Same as R228 (V222, AGC diode, filter)
R365		Same as R201 (V222, Squelch diode, voltage divider)
R366		Same as R217 (V222, Squelch diode, filter)
R367		Same as R362 (V223, A-F ampl. audio isolation)
R368	71-30945	Resistor—Variable, 250,000 ohms (V223, A-F ampl., line level control)
R369		Same as R322 (V223, A-F ampl. cathode)
R370		Same as R248 (V223, A-F ampl. plate decoupling)
R371		Same as R308 (V223, Squelch triode, plate decoupling)
R372		Same as R362 (V223, squelch triode, grid)
R373	71-30898	Resistor — Composition, 1.5 megohms, ±10%, ½ watt (V223, Squelch triode, grid)
R374		Same as R230 (V223, Squelch triode, grid isolation)
R375		Same as R345 (V216, T207, input swamping)
		SWITCHES
S201, A, B, C	71-31064	Switch—Rotary, 3 section, 4 position, Channel Selector (Antenna, PA)
S201, D, E, F	71-31071	Switch—Rotary, 3 section, 4 position, Channel Selector (IPA, 3rd Bal. Mod.)
S201, G, H, I, J	71-31063	Switch—Rotary, 4 section, 4 position, Channel Selector (Osc. & Rec.)
S201, K	71-31065	Switch—Rotary, 1 section, 4 position (Remote Indicator) Auxiliary
S202	71-30952	Switch—Rotary (Carrier In-Out)
S203	71-31070	Switch—Rotary, 2 section, 5 position (Meter Switch)
S204	71-31069	Switch—Rotary, 1 section, 2 position (Sideband Selector)
S205	71-30961	Switch—Rotary (AGC)
S206	71-30960	Switch—Rotary (Noise Limiter)
		TRANSFORMERS
T201	71-31111	Transformer—I-F, 1400 kc., Automatic Mfg. Corp. Type (M1-409K) 1500-1 with mtg. clip #1041 (2nd Bal. Mod. Output)
T202	71-31032	Transformer—I-F, 250 kc., Similar to Automatic Mfg. Corp. type 1655-14 with mtg. clip #1041 (2nd Bal. Mod. Input)
T203		Same as T201 (1st and 2nd Mixer Interstage)
T204		Same as T202 (2nd and 3rd I-F Interstage)

PARTS LIST—Continued

SSB-1 MARK IV TRANSMITTER/RECEIVER SECTION

SYMBOL NO.	STOCK NO.	DESCRIPTION
T205		Same as T202 (AGC plate)
T206		Same as T202 (3rd I-F output)
T207		Same as T202 (2nd Mixer Output)
		TERMINAL BOARDS
TB201	71-31040	Terminal Board—Cinch, #1755 (Rec. Ant. Input)
TB202	71-30978	Terminal Board—H. B. Jones, #5-140 (Remote Indicator Terminals)
TB203	71-31083	Terminal Board—Cinch, #1766 (Ext. AGC, Rec. Mute, Int. Rec. Mute)
		TEST JACKS
TP201	71-31076	Jack—Red, Johnson, #105-602-1 (V207, input test)
TP202		Same as TP201 (V208, 1150-1650 kc. input test)
TP203		Same as TP201 (V209, 250 kc. input test)
TP204		Same as TP201 (V215, 1st mixer grid test)
TP205		Same as TP201 (V216, 2nd mixer grid test)
XV201	71-30942	Socket—Tube, Octal
XV202		Same as XV201
XV203		Same as XV201
XV204	71-31007	Socket—Tube, 7-pin miniature
XV205	71-31008	Socket—Tube, 9-pin miniature
XV206		Same as XV205
XV207		Same as XV205
XV208		Same as XV205
XV209		Same as XV205
XV210		Same as XV205
XV211		Same as XV205
XV212		Same as XV204
XV213		Same as XV204
XV214		Same as XV204
XV215		Same as XV204
XV216		Same as XV204
XV217		Same as XV205
XV218		Same as XV204
XV219		Same as XV204
XV220		Same as XV204
XV221		Same as XV204
XV222		Same as XV204
XV223		Same as XV205
		TUBES
V201		Tube—RCA type 6146 (Power Amplifier)
V202		Same as V201 (Power Amplifier)
V203		Same as V201 (Power Amplifier)
V204		Tube—RCA type 6AL5 (Modulation rectifier)
V205		Tube—RCA type 6CL6 (Intermediate Power Amplifier)
V206		Same as V205 (Intermediate Power Amplifier Coupler)
V207		Tube—RCA type 12AT7 (3rd Balanced Modulator)
V208		Same as V207 (2nd Balanced Modulator)
V209		Tube—RCA type 12AX7 (Balanced Modulator)
V210		Same as V209 (Audio Amplifier)
V211		Same as V205 (4.4-16.4 mc. Osc.)
V212		Tube—RCA type 6BE6 (1150-1650 kc. Osc.)
V213		Same as V212 (250 kc. Osc.)
V214		Tube—RCA type 6BA6 (R-F Amplifier)
V215		Same as V212 (1st Mixer)
V216		Same as V212 (2nd Mixer)
V217		Same as V209 (1st I-F Amplifier)
V218		Same as V214 (2nd I-F Amplifier)
V219		Same as V214 (3rd I-F Amplifier)
V220		Same as V214 (AGC Amplifier)
V221		Same as V204 (Demodulators)
V222		Same as V204 (AGC Diode—Squelch Diode)
V223		Same as V207 (A-F Amplifier—Squelch Triode)
		CRYSTALS
Y201		Crystal—Type CR-27/U, order by frequency (Channel 1)
Y202		Same as Y201 (Channel 2)
Y203		Same as Y201 (Channel 3)
Y204		Same as Y201 (Channel 4)
Y205	Dwg. No. 1041511-2	Crystal—1150 kc.
Y206	Dwg. No. 1041511-3	Crystal—1650 kc.
Y207	Dwg. No. 1041511-4	Crystal—250 kc.
		CRYSTAL OVEN
E201	71-31112	Crystal Holder and Oven, 75° C. ± 1° (Y203, Y204)
E202		Same as E201 (Y201, Y202)
E203		Same as E201 (Y205, Y206)
XE201		Same as XV201 (E201)
XE202		Same as XV201 (E202)
XE203		Same as XV201 (E203)
XE204		Socket—Crystal (Y207)
XDS201	71-31043	Socket—Transmit lamp (DS201)

PARTS LIST—Continued

SSB-1 MARK IV POWER SUPPLY SECTION

SYMBOL NO.	STOCK NO.	DESCRIPTION
		CAPACITORS
C101	71-31019	Capacitor—Ceramic, disc, 0.01 mf., —0% +100%, 500 v. (Plate coupling, V101A)
C102		Same as C101 (Plate coupling, V101A)
C103		Same as C101 (Grid coupling, V101A)
C104		Same as C101 (VOK input, V102)
C105		Same as C101 (Speech Clipper coupling, V101B)
C106		Same as C101 (Screen bypass, V101B)
C107		Not used
C108	71-30989	Capacitor—Mica, 27 mmf., ±10%, 500 v. JAN CM20B27 OK (Tone osc. coupling, V103A)
C109	71-30998	Capacitor—Mica, 2200 mmf., ±10%, 500 v. (Tone osc. waveshaping, V103A)
C110	71-31011	Capacitor—Ceramic disc, 0.01 mf., ±20%, 500 v. (Grid bypass, V101B)
C111		Same as C110 (Audio coupling, V101B)
C112	71-30992	Capacitor—Mica, 390 mmf., ±10%, 500 v. (Tone osc. freq. capacitor, V103A)
C113		Same as C112 (Tone osc. freq. capacitor, V103A)
C114		Same as C112 (Tone osc. freq. capacitor, V103A)
C115		Same as C101 (Key bypass, V103A)
C116	71-30920	Capacitor—Electrolytic, 50 mf., 150 v. (Relay delay, K101)
C117	71-30984	Capacitor—Electrolytic, 125 mf., —10%, +40%, 450 v. WVDC, with cardboard insulating tube (HV filter)
C118		Same as C117 (HV filter)
C119		Same as C117 (HV filter)
C120		Same as C101 (AC line bypass, TB101)
C121		Same as C101 (AC line bypass, TB101)
C122		Same as C101 (AC line bypass, TB101)
C123		Not used
C124	71-31042	Capacitor—Electrolytic, 20 mf., 450 WVDC, Common Negative (LV filter)
C125		Not used
C126	71-31041	Capacitor—Electrolytic, 300 mf., 150 WVDC (Bias supply filter)
C127		Same as C101 (V105 bypass)
C128		Same as C101 (K102, contact bypass)
C129		Same as C109 (V106, plate bypass)
C130	71-30999	Capacitor—Mica, 4700 mmf., ±10%, 500 v. (V107, plate bypass)
C131	71-30985	Capacitor—Electrolytic, 10 mf., —10%, +40%, 150 WVDC, 7/16" d x 1⅞", pigtail leads, Sprague type DEE or equivalent (B-plus decoupling)
C132		Same as C131 (B-plus decoupling)
C133		Not used
C134		Not used
C135		Same as C101 (V103A, Plate-grid coupling)
C136		Same as C131 (B-plus filter)
C137		Not used
C138		Same as C101 (Audio coupling, V106)
		SEMICONDUCTOR DIODES
CR101		Not used
CR102	71-31050	Rectifier, silicon, Sarkes-Tarzian, type 40K (LV rectifier)
CR103		Same as CR102 (LV rectifier)
CR104		Same as CR102 (LV rectifier)
CR105		Same as CR102 (LV rectifier)
CR106		Same as CR102 (Bias rectifier)
CR107	71-31049	Diode—Silicon, 1N2070, Texas Instrument, #904 (Meter rectifier)
CR108		Same as CR102 (HV rectifier)
CR109		Same as CR102
CR110		Same as CR102
CR111		Same as CR102
CR112		Same as CR102
CR113		Same as CR102
CR114		Same as CR102
CR115		Same as CR102
CR116		Same as CR102
CR117		Same as CR102
CR118		Same as CR102
CR119		Same as CR102
CR120		Same as CR102
CR121		Same as CR102
CR122		Same as CR102
CR123		Same as CR102
		INDICATORS
DS101	71-31043	Dial Light, Neon. Red, Incl. mounting nut, Omniglow, type 1010A1 (Transmitter "ON" indicator)
DS102	71-31044	Dial Light, Neon, Amber, Incl. mounting nut, Omniglow, type 1010A3 (Receiver "ON" indicator)
DS103	71-31045	Dial Light, Neon, White, Incl. mounting nut, Omniglow, type 1010A4 (Power "ON" indicator)
DS104		Same as DS103 (Remote desk set #3 indicator)
DS105		Same as DS103 (Remote desk set #2 indicator)
DS106		Same as DS103 (Remote desk set #1 indicator)
DS107		Same as DS103 ("LINE" indicator)
DS108	71-30948	Buzzer, 48 v. DC, Edwards, type #15, size 1 (Local operator buzzer)
		FUSES
F101	71-31090	Fuse, 5A., Time Lag, 125 v., Littlefuse type 3AG, Slo-Blo (Main fuse)

NOTE

Some units use type F4 diodes (CR107 to CR123). These do not require resistors R162 to R176.

PARTS LIST—Continued

SSB-1 MARK IV POWER SUPPLY SECTION

SYMBOL NO.	STOCK NO.	DESCRIPTION
F102	71-31091	Fuse, 3A., Time Lag, 125 v., Littlefuse type 3AG, Slo-Blo (HV power supply fuse)
F103	71-30943	Fuse, 1A., Time Lag, 125 v., Littlefuse type 3AG, Slo-Blo (LV power supply fuse)
F104	71-31119	Fuse, 0.75A.,250 v., Littlefuse type 3AG (Filament transformer fuse)
F105	71-31013	Fuse, 0.5A., 250 v., Littlefuse type 3AG (Crystal oven and keying relay transformer fuse)
		HANDSET
HS101	71-31048	Handset assy., Stromberg Carlson, style no. 29, black, with 1 form A (SPST, normally open) detent switch, 4 conductor rubber covered Retrax cable, 4 ft. long, 10 inches long retracted (approx.)
		RECEPTACLES
J101	71-31046	Jack, telephone type, open circuit, Switchcraft type 11 (Key jack)
J102	71-30942	Socket, tube type, octal (VOK-10 receptacle)
J103	71-31047	Jack, telephone type, Switchcraft type 13A (Headphone jack)
J104	71-31052	Safety terminal, James Millen Mfg. Co. No. 37001-D (High voltage lead receptacle)
J105		Same as J102 (Selective Ringer receptacle)
		RELAYS
K101	71-31092	Relay, DPDT contacts, Coil, 6.3 v. AC, 50/60 cycles, Advance, type GHA/2C/6VA (Keying relay)
K102	71-31051	Relay, SPDT contacts, Coil, 10,000 ohms, 4.5 ma., Potter & Brumfield Type LB-1228 (VOK-MANUAL relay)
		REACTORS
L101	71-31067	Reactor—Filter, 2-12 hy., 80-250 ma. DC (HV filter)
L102	71-31068	Reactor—Filter, 6 hy., 140 ma. DC (LV filter)
		LOUDSPEAKER
LS101	71-30957	Loudspeaker—3.5 ohms
		RESISTORS
R101	71-30911	Resistor — Composition, 47,000 ohms, ±10%, 1 watt (V101A, plate)
R102	71-30904	Resistor—Composition, 1000 ohms, ±10%, 1 watt (V101A, cathode)
R103	71-30897	Resistor—Composition, 1 megohm, ±10%, ½ watt (V101A, grid)
R104	71-30896	Resistor — Composition, 820,000 ohms, ±10%, ½ watt (V102, plate)
R105	71-30893	Resistor — Composition, 270,000 ohms, ±10%, ½ watt (V102, plate)
R106	71-30889	Resistor — Composition, 100,000 ohms, ±10%, ½ watt (V102, plate)
R107		Same as R106 (V102, cathode)
R108		Same as R107 (V102, cathode)
R109	71-30912	Resistor — Composition, 220,000 ohms, ±10%, 1 watt (V101B, plate)
R110		Same as R103 (V101B, screen)
R111		Same as R102 (V101B, cathode)
R112		Not used
R113		Not used
R114		Not used
R115		Same as R103 (V101B, grid)
R116		Same as R102 (Bias divider)
R117	71-30907	Resistor — Composition, 10,000 ohms, ±10%, 1 watt (Bias divider)
R118	71-30926	Resistor — Composition, 22,000 ohms, ±10%, 2 watt (Bias decoupling)
R119		Same as R117 (Bias divider)
R120	71-30875	Resistor—Composition, 470 ohms, ±10%, ½ watt (Relay delay)
R121	71-30881	Resistor—Composition, 2200 ohms, ±10%, ½ watt (Cathode voltage divider, V103A)
R122	71-30882	Resistor — Composition, 10,000 ohms, ±10%, ½ watt (Cathode voltage divider, V103A)
R123	71-30895	Resistor — Composition, 470,000 ohms, ±10%, ½ watt (V103A, tuned circuit resistor)
R124		Same as R123 (V103A, tuned circuit resistor)
R125		Same as R123 (V103A, tuned circuit resistor)
R126		Same as R103 (V103A grid)
R127		Not used
R128	71-30949	Resistor—Wire wound, 7500 ohms, 25 watt, Ohmite #0214 (HV bleeder)
R129		Same as R128 (HV bleeder)
R130		Same as R128 (HV bleeder)
R131	71-31022	Resistor—Fixed, film type, 100,000 ohms, ±1%, ½ watt (AC power line metering)
R132	71-30928	Resistor—Fixed, composition, 39,000 ohms, ±10%, 2 watts (LV bleeder)
R133	71-31030	Resistor—Wire wound, adjustable, 3100 ohms, ±5%, 10 watts (or 3000 ohms, "Ohmite" #1029 with mtg. brackets #5) (B+ 150 v. adjust)
R134		Not used
R135	71-31029	Resistor—Wire wound, adjustable, 2000 ohms, ±5%, 10 watts (or "Ohmite" #1026 with mtg. brackets #5) (—85 v. adjust)
R136	71-31109	Resistor—Variable, 50,000 ohms, Linear Taper, ½ watt (Bias adjust)
R137	71-30946	Resistor — Variable, 1 megohm, Linear Taper, ¼ watt (VOK sensitivity adjust)
R138	71-30947	Resistor — Variable, 1000 ohms, Linear Taper, ¼ watt (LINE input level adjust)
R139	71-31093	Resistor—Variable, 250,000 ohms, Linear Taper, ¼ watt (Speaker volume control)
R140		Same as R106 (+215 v. dropping resistor)
R141		Same as R106 (+215 v. dropping resistor)
R142		Not used
R143		Resistor—Composition, 1500 ohms, ±10%, ½ watt
R144	71-30901	Resistor—Composition, 10 ohms, ±10%, 1 watt (Speaker/Headphone load)
R145		Same as R144 (Speaker/Headphone load)
R146	71-30902	Resistor—Composition, 100 ohms, ±10%, 1 watt (Handset isolation)

PARTS LIST—Continued

SSB-1 MARK IV POWER SUPPLY SECTION

SYMBOL NO.	STOCK NO.	DESCRIPTION
R147	71-30892	Resistor—Composition, 220,000 ohms, ½ watt (Audio load)
R148		Same as R102 (Bias divider)
R149		Same as R147
R150	71-30885	Resistor—Composition, 27,000 ohms, ±10%, ½ watt
R151	71-30891	Resistor — Composition, 150,000 ohms, ±10%, ½ watt
R152		Same as R109 (V103A, plate load)
R153	71-30899	Resistor — Composition, 3.3 megohms, ±10%, ½ watt (V103A, grid)
R154	71-30909	Resistor — Composition, 15,000 ohms, ±10%, 1 watt (V106, plate decoupling)
R155	71-30913	Resistor—Composition, 750 ohms, ±5%, 1 watt (V106, cathode)
R156		Same as R155 (V107, cathode)
R157		Same as R102 (—85 v. dropping resistor)
R158		Same as R107 (LINE, audio isolation)
R159	71-30927	Resistor — Composition, 33,000 ohms, ±10%, 2 watt (K102, series resistor)
R160		Same as R131 (AC power line metering)
R161	71-30894	Resistor — Composition, 330,000 ohms, ±10%, ½ watt (HV rectifier)
R162		Same as R161
R163		Same as R161
R164		Same as R161
R165		Same as R161
R166		Same as R161
R167		Same as R161
R168		Same as R161
R169		Same as R161
R170		Same as R161
R171		Same as R161
R172		Same as R161
R173		Same as R161
R174		Same as R161
R175		Same as R161
R176		Same as R161
		SWITCHES
S101	71-31028	Switch — Toggle, DPST, Cutler-Hammer, Type 7561K4 (POWER switch)
S102	71-31026	Switch — Toggle, SPST, Cutler-Hammer, Type 7501K13 (RECEIVER switch)
S103		Same as S102 (TRANSMITTER switch)
S104	71-30979	Switch—Top 5 position, SPST, "Ohmite," type 111-5 (POWER LINE switch)
S105	71-31027	Switch — Toggle, DPDT, Cutler-Hammer, type 7565K5 (TELEPHONE/TELEGRAPH switch)
S106		Same as S105 (MANUAL/VOK switch)
S107	71-31025	Switch — Toggle, SPDT, Cutler-Hammer, type 7505K4 (SPEAKER/HANDSET switch)
S108	71-31058	Switch—Rotary, 6 pole, 3 position (MONITOR/INTERCOM/OPERATE switch)
S109	71-31057	Switch—Rotary, 6 pole, 5 position (LOCAL/REMOTE/LINE switch)
		TRANSFORMERS
T101	71-31059	Transformer—Filament, Pri. 115 v. AC, 50/60 cps. Sec. 6.45 v. AC, 6.5A (Transmitter filaments)
T102	71-31060	Transformer—Power, Pri. 115 v. AC, 50/60 cps. Sec. 750 v. 245 MA (HV plate supply)
T103	71-31062	Transformer—Audio, 600-ohm line to 600-ohm load, Pri. 5 ma. DC (600-ohm LINE input)
T104	71-31061	Transformer—Power, Pri. 115 v. AC, 50/60 cps. Sec. #1 230 v. 200 ma., Sec. #2 110 v. 100 ma. (LV power supply)
T105		Same as T101 (Receiver filaments)
T106	71-31066	Transformer—Autotransformer, 50/60 cps. (AC line voltage adjustment)
T107	71-30970	Transformer—Pri. 115 v. AC, 50/60 cps. Sec. 6.3 v. AC, 2.5A (Oven heater and relay supply)
T108	71-30954	Transformer—Audio output, 6AK6 plate to 600-ohm line (V106 output)
T109	71-30953	Transformer—Audio output, 6AK6 plate to 3.5 ohm speaker (V107 output)
		TERMINAL BOARDS
TB101	71-30982	Terminal Board—21 terminals, H. B. Jones #21-1404
TB102	71-31082	Terminal Board—3 terminals, Cinch #1783 (AC power connection to T106)
TB103	71-31095	Terminal Board—20 terminals (Remote desk set #1, #2 connections)
TB104	71-30981	Terminal Board—19 terminals (Remote desk set #3. Input and output connections)
		TEST JACK
TP101	71-31076	Jack—Tip, red. Johnson #105-602-1 (Audio output test)
		TUBES
V101	RCA 6U8	Tube—RCA type 6U8 (Audio amplifier, microphone amplifier)
V102	RCA 6AL5	TUBE—RCA type 6AL5 (Speech Clipper)
V103	RCA 12AT7	Tube—RCA type 12AT7 (Tone oscillator)
V104	RCA OD3/VR150	Tube—RCA type OD3/VR150 (Voltage regulator)
V105	RCA OA3/VR75	Tube—RCA type OA3/VR75 (Voltage regulator)
V106	RCA 6AK6	Tube—RCA type 6AK6 (Audio Output—LINE)
V107		Same as V106 (Audio output, Spkr/Handset)
		SOCKETS
XF101	71-31077	Fuse holder
XV101	71-31008	Socket—Tube, miniature, 9-pin
XV102	71-31007	Socket—Tube, miniature, 7-pin
XV103		Same as XV101
XV104		Same as J102
XV105		Same as J102
XV106		Same as XV102
XV107		Same as XV102
		KNOBS
MP115	71-30986	Knob, Dial, skirted, round, Raytheon Mfg. Co. #90-3-2G

		MISC. MECHANICAL PARTS
MP103	Dwg. No. 1048673-1	Panel Assembly
MP104	347357-3	Brace
MP105	347357-2	Brace
MP106	1044238-3	Handle
MP108	1043162-1	Speaker Grille
MP109	1043279-1	Bracket, fuse holder
MP110	347360-1	Slide (cabinet)
MP111	347360-2	Slide (cabinet)
MP114	1043115-1	Hanger, handset, Western Electric #KS-10080-2
MP123	1044273-1	Plate, Duplex

SSB-1

MARK IV

MI-22803-C

INSTRUCTION BOOK

ADDENDA TO IB-96337-4

RCA INTERNATIONAL DIVISION
RADIO CORPORATION OF AMERICA
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SSB-1

MARK IV

MI-22803-C

INSTRUCTION BOOK

ADDENDA TO IB-95327-A

SSB-1 MARK IV

ADDENDA TO IB-96337-3

This addenda applies to SSB-1 Mark IV equipments having serial numbers 64001 and higher. The addenda is included with and is part of the instruction book (IB-96337-3) for the SSB-1 Mark IV equipment. All SSB-1 Mark IV units to which this addenda is applicable bear the designation MI-22803-C.

The basic purpose of this addenda is to include a revised replacement parts list and revised schematic diagrams for the transmitter/receiver and power supply sections of the equipment.

In addition to the parts list and schematic diagrams the following changes apply to the text and illustrations in IB-96337-3.

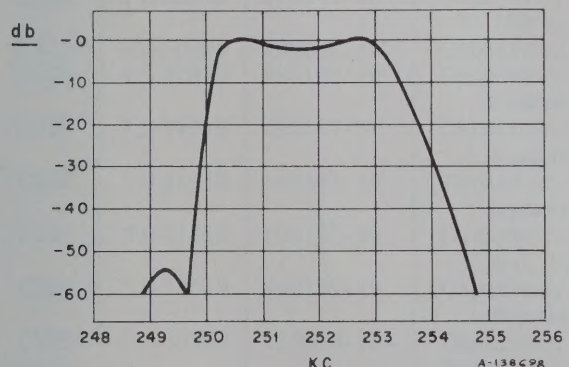
1. All references to the Mechanical Filter or Electro-mechanical Filter no longer apply.

MI-22803-C uses a crystal filter. On page 12, the text referring to the mechanical filter is no longer applicable. The following text should be substituted.

CRYSTAL FILTER

The 251 kc and 249 kc signals present at the output of V209 are introduced into filter FL201, a crystal filter designed to pass a band of frequencies in the 250 kc range with excellent rejection of frequencies outside the desired passband. The filter contains a network of five accurately cut crystals, which gives the crystal filter its excellent characteristics of carrier rejection, low-frequency response, and low ripple in the pass-band. The entire filter assembly is housed in a metal case filled with dry nitrogen and hermetically sealed. No adjustments are required in the filter unit. A stable frequency response is obtained over an ambient temperature range of 0 de. C. to 55 deg. C.

The following response curve is substituted for the response curve shown in figure 9.



CRYSTAL FILTER RESPONSE CURVE

2. The changes listed below should be noted in the test and illustrations of the instruction book. All references are to the latest schematic diagrams as shown in this addenda.

Page 5: SEMICONDUCTOR DIODES

Power Supply
21 Silicon Diodes, type 1N2071

Page 10: Figure 5. Substitute "crystal filter" for "Mechanical filter".

Page 13: Figure 10. For correct configuration of T201 refer to transmitter/receiver schematic diagram.

At the input to FL201 (crystal filter) C391 replaces C246 and the value is changed to 68 mmf.

Page 18: Figure 17. Mechanical filter is changed to crystal filter.

Page 21: Figure 20. Refer to transmitter/receiver schematic diagram for crystal filter circuit components.

FIRST I-F AMPLIFIER

References are changed to "crystal filter" instead of "mechanical filter".
V107, in the last line of the left-hand column, should read "(V218)".

Page 23: AUDIO AMPLIFIER AND OUTPUT

The LINE LEVEL CONTROL is not located as described. It is located inside the transmitter/receiver unit. Refer to figure 59. The LINE LEVEL CONTROL is in the lower left-hand corner of the illustration.

Page 26: Figure 25. At the junction of K201 and K202 the voltage should be indicated as "-85 v." not "L. V. B+" as shown.

Page 28: Figure 27. Resistors R161 to R176 are not used. Diodes used are 1N2071 (CR108 to CR123).

Page 30: Refer to transmitter/receiver schematic diagram for correct connections to K201 and K202.

Page 59: Refer to response curve for crystal filter.

Page 64: Refer to transmitter/receiver schematic diagram and power supply schematic diagram for correct connections to transmit/receiver relays.

An asterisk (*) adjacent to the component symbol in the replacement parts list indicates that more than one component of that description is used in the SSB-1 Mark IV equipment. See the separate table at the end of the parts list for quantities used for the asterisked items.

SSB-1 MARK IV - TRANSMITTER/RECEIVER SECTION

Symbol	Stock No.	Drawing No.	Description
			CAPACITORS
C201*	71-31053	1043185-1	Capacitor, variable, mica, 1400-3055 mmf, 250 v., Elmenco type 315 (Channel 1, PA loading)
C202	71-31053	1043185-1	Capacitor, variable, mica, 1400-3055 mmf, 250 v., Elmenco type 315 (Channel 2, PA loading)
C203*	71-31054	1043185-2	Capacitor, variable, mica, 340-1070 mmf, 250 v., Elmenco type 307M (Channel 3, PA loading)
C204	71-31054	1043185-2	Capacitor, variable, mica, 340-1070 mmf, 250 v., Elmenco type 307M (Channel 4, PA loading)
C205*			Capacitor, variable, air, 12-250 mmf, 1500 v., E. F. Johnson type 250 R15 (Channel 4, PA tuning)
C206			Capacitor, variable, air, 12-250 mmf, 1500 v., E. F. Johnson type 250 R15 (Channel 3, PA tuning)
C207			Capacitor, variable, air, 12-250 mmf, 1500 v., E. F. Johnson type 250 R15 (Channel 2, PA tuning)
C208			Capacitor, variable, air, 12-250 mmf, 1500 v., E. F. Johnson type 250 R15 (Channel 1, PA tuning)
C209*	71-31000	722046-109	Capacitor, mica, 100 mmf, ±10%, 2500 v. (Channel 1, PA tuning padder)
C210	71-31000	722046-109	Capacitor, mica, 100 mmf, ±10%, 2500 v. (Channel 2, PA tuning padder)
C211*	71-31098		Capacitor, disc ceramic, 1000 mmf, ±20%, 1500 v., Erie type 125 KV-102 (Output coupling)
C212	71-31098		Capacitor, disc ceramic, 1000 mmf, ±20%, 1500 v., Erie type 125 KV102 (750 v. B-plus bypass)
C213*	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v. (V201 screen bypass)
C214	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v. (V202 screen bypass)
C215	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v. (V203 screen bypass)
C216	71-31114		Capacitor, ceramic, 3 mmf, ±10%, 5000 v., NPO. Centralab type 855-3Z (PA neutralizing)
C217*	71-31020	990167-111	Capacitor, disc ceramic, 470 mmf, ±20%, 500 v., (V204 coupling)
C218	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v., (V204, R205 bypass)
C219			Not used
C220*	71-30951	258851-7	Capacitor, variable, ceramic, 20-125 mmf, Centralab type CRL-823-AN (PA neutralizing)
C221	71-31115	722002-133	Capacitor, mica, 270 mmf, ±10%, 300 v. (IPA tuning padder)
C222	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v. (V205 RF bypass 150 v., reg. DC)
C223*	71-30994	722002-147	Capacitor, mica, 1000 mmf, ±10%, 300 v., (V205 IPA coupling)
C224	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v. (V205 screen bypass)
C225	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v. (V205 screen bypass)
C226	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v. (V205 cathode bypass)
C227	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v. (bal. mod. tuning ind. bypass)
C228	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v. (V206 screen bypass)
C229*	71-30998	722018-155	Capacitor, mica, 2200 mmf, ±10%, 500 v. (V206 output coupling)
C230			Not used
C231	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v. (V207 plate bypass)
C232*	71-30944	120877-5	Capacitor, variable, air, 6.7-140 mmf, 600 v., Hammarlund type APC-140 (V217 plate, channel 1 tuning)
C233	71-30944	120877-5	Capacitor, variable, air, 6.7-140 mmf, 600 v., Hammarlund type APC-140 (V207 plate channel 2 tuning)
C234	71-30944	120877-5	Capacitor, variable, air, 6.7-140 mmf, 600 v., Hammarlund type APC-140 (V207 plate channel 3 tuning)

SSB-1 MARK IV - TRANSMITTER/RECEIVER SECTION

Symbol	Stock No.	Drawing No.	Description
C235	71-30944	120877-5	Capacitor, variable, air, 6.7-140 mmf, 600 v., Hammarlund type APC-140 (V207 plate channel 4 tuning)
C236	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 600 v., (V207 cathode bypass)
C237*	71-30988	722002-107	Capacitor, mica, 22 mmf, ±10%, 500 v., (V207 grid coupling)
C238	71-30988	722002-107	Capacitor, mica, 22 mmf, ±10%, 500 v., (V207 grid coupling)
C239*	71-30966	341816-1	Capacitor, variable, air trimmer, 4-34 mmf, Rogers Majestic CD-11 (V208 balance adj.)
C240	71-30988	722002-107	Capacitor, mica, 22 mmf, ±10%, 500 v. (V208 plate tuning)
C241	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v. (V208 plate bypass)
C242*	71-30991	722002-135	Capacitor, mica, 330 mmf, ±10%, 500 v. (V212 output coupling)
C243	71-31105		Capacitor, variable, ceramic, 1.5-7 mmf, 500 v. Erie type TS2A-1.5 (carrier level control)
C244	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v. (V218 grid coupling)
C245	71-30951	258851-7	Capacitor, variable, ceramic, 20-125 mmf, Centralab type CRL-823-AN (FL201 output tuning)
C246			Not used
C247			Not used
C248	71-30951	258851-7	Capacitor, variable, ceramic, 20-125 mmf, Centralab type CRL-823-AN (FL201 input tuning)
C249			Not used
C250			Not used
C251		727851-104	Capacitor, mica, 15 mmf, ±10%, 300 v. (FL201 input tuning)
C252	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v., (V209 plate bypass)
C253	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v., (V217 output coupling)
C254	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v., (V217 output coupling)
C255	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v., (V216 plate bypass)
C256	71-30966	341816-1	Capacitor, variable, air trimmer, 4-34 mmf, Rogers Majestic CD-11 (FL201 input tuning and balance)
C257	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v., (V209 cathode bypass)
C258	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v., (V217 cathode bypass)
C259	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v., (V210 output coupling)
C260	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v., (V210 output coupling)
C261	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v., (meter bypass)
C262			Not used
C263*	71-31021	990167-113	Capacitor, disc ceramic, 1000 mmf, ±20%, 500 v., (V209 input bypass)
C264	71-31021	990167-113	Capacitor, disc ceramic, 1000 mmf, ±20%, 500 v., (V209 input bypass)
C265	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v., (V208 cathode bypass)
C266	71-31020	990167-111	Capacitor, disc ceramic, 470 mmf, ±20%, 500 v., (IPA, meter coupling)
C267	71-31020	990167-111	Capacitor, disc ceramic, 470 mmf, ±20%, 500 v., (V210 audio coupling)
C268		722002-104	Capacitor, mica, 15 mmf, ±10%, 500 v., (V207 grid coupling)
C269*			Capacitor, ceramic, 5 mmf, ±20%, 600 v., Centralab type D6-050 (V208 grid coupling)
C270			Capacitor, ceramic, 5 mmf, ±20%, 600 v., Centralab type D6-050 (V208 grid coupling)
C301*			Capacitor, ceramic, 51 mmf, 500 v., N220. Part of L203 assy. (V214 grid tuning channel 1)
C302			Capacitor, ceramic, 51 mmf, 500 v., N220. Part of L204 assy. (V214 grid tuning channel 2)
C303*			Capacitor, ceramic, 30 mmf, 500 v., N220. Part of L205 assy. (V214 grid tuning channel 3)
C304			Capacitor, ceramic, 30 mmf, 500 v., N220. Part of L206 assy. (V214 grid tuning channel 4)

SSB-1 MARK IV - TRANSMITTER/RECEIVER SECTION

Symbol	Stock No.	Drawing No.	Description
C305	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v., (V214 AGC bypass)
C306		722002-102	Capacitor, mica, 10 mmf ±10%, 500 v., (V214 grid tuning)
C307	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v., (V214 cathode bypass)
C308	71-31019	990167-19	Capacitor, disc ceramic, -0% +100%, 500 v., (V214 screen bypass)
C309			Capacitor, ceramic, 51 mmf, 500 v., N220. Part of L207 assy. (V214 plate tuning channel 1)
C310			Capacitor, ceramic, 51 mmf, 500 v., N220. Part of L208 assy. (V214 plate tuning channel 2)
C311			Capacitor, ceramic, 30 mmf, 500 v., N220. Part of L209 assy. (V214 plate tuning channel 3)
C312			Capacitor, ceramic, 30 mmf, 500 v., N220. Part of L210 assy. (V214 plate tuning channel 4)
C313	71-30962	340638-2	Capacitor, disc ceramic, .02 mf +80% -20%, 500 v., (V214 plate bypass)
C314	71-30918	90581-333	Capacitor, ceramic, 100 mmf, ±10%, 500 v., (V215 grid coupling)
C315	71-31019	990167-19	Capacitor, disc ceramic, .01 mf, -0% +100%, 500 v., (V215 AGC bypass)
C316*	71-31106		Capacitor, variable, air, 2.3 -14 mmf, Johnson type 15 M11 (Y204 tuning)
C317	71-31106		Capacitor, variable, air, 2.3 -14 mmf, Johnson type 15 M11 (Y203 tuning)
C318*	71-30995	722002-540	Capacitor, mica, 510 mmf, ±5%, 500 v., (V211 grid tuning channel 3)
C319	71-30995	722002-540	Capacitor, mica, 510 mmf, ±5%, 500 v., (V211 grid tuning channel 4)
C320*	71-30997	722018-149	Capacitor, mica, 1200 mmf, ±10%, 500 v., (V211 grid tuning channel 2)
C321	71-31106		Capacitor, variable, air, 2.3 -14 mmf. Johnson type 15 M11 (Y202 tuning)
C322	71-31106		Capacitor, variable, air, 2.3 -14 mmf, Johnson type 15 M11 (Y201 tuning)
C323	71-30997	722018-149	Capacitor, mica, 1200 mmf, ±10%, 500 v., (V211 grid tuning channel 1)
C324*	71-31011	936625-1	Capacitor, disc ceramic, .01 mf, ±20%, 500 v., (V211 screen blocking)
C325	71-30994	722002-147	Capacitor, mica, 1000 mmf, ±10%, 300 v., (V211 output coupling)
C326	71-30991	722002-135	Capacitor, mica, 330 mmf, ±10%, 500 v., (V215 grid coupling)
C327	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V211 plate bypass)
C328	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V215 cathode bypass)
C329	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V215 AGC filter)
C330	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V215 screen bypass)
C331	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V215 plate bypass)
C332	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V216 AGC filter)
C333*	71-30964	340638-6	Capacitor, disc ceramic, .05 mf, +80% -20%, 500 v., (V216 AGC filter)
C334	71-30917	90581-319	Capacitor, ceramic, 27 mmf, ±10%, 500 v., (V216 grid coupling)
C335	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V212 screen bypass)
C336	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V216 cathode bypass)
C337	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V216 screen bypass)
C338	71-31019	990167-19	Capacitor, disc ceramic, 101 mf, -0% +100%, 500 v., (V212 plate bypass)
C339	71-30994	722002-147	Capacitor, mica, 1000 mmf, ±10%, 300 v., (V212 grid coupling)
C340*	71-31001	727851-131	Capacitor, mica, 200 mmf, ±10%, 500 v., (V212 grid tuning)
C341		119870-3	Capacitor, variable, air, 6 - 50 mmf (V212 speech clarifier)
C342	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V216 plate bypass)
C343*	71-31108		Capacitor, variable, ceramic, 4-30 mmf, 500 v., Erie TS2A-4 (Y206 tuning)
C344	71-31108		Capacitor, variable, ceramic, 4-30 mmf, 500 v., Erie TS2A-4 (Y205 tuning)
C345	71-31021	990167-113	Capacitor, disc ceramic, 1000 mmf, ±20%, 500 v., (Y207 tuning)

Symbol	Stock No.	Drawing No.	Description
C346	71-30966	341816-1	Capacitor, variable, air trimmer, 4-34 mmf, Rogers Majestic CD-11 (Y207 tuning)
C347	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V218 AGC filter)
C348	71-31011	936625-1	Capacitor, disc ceramic, .01 mf, ±20%, 500 v., (V213 xtal coupling)
C349	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V218 cathode bypass)
C350	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V213 xtal coupling)
C351	71-31010	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V213 screen bypass)
C352	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V218 screen bypass)
C353	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V218 plate bypass)
C354	71-30993	722002-139	Capacitor, mica, 470 mmf, ±10%, 500 v., (V220 grid coupling)
C355	71-30964	340638-6	Capacitor, disc ceramic, .05 mf, +80% -20%, 500 v., (V220 cathode bypass)
C356	71-30964	340638-6	Capacitor, disc ceramic, .05 mf, +80% -20%, 500 v., (V219 cathode bypass)
C357	71-31019	990167-19	Capacitor, disc seramic, .01 mf -0% +100%, 500 v., (V219 AGC filter)
C358	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V220 plate bypass)
C359	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V220 screen bypass)
C360	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V219 screen bypass)
C361*		722002-123	Capacitor, mica, 100 mmf, ±10%, 500 v., (V213 output coupling)
C362	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V219 plate bypass)
C363		722002-123	Capacitor, mica, 100 mmf, ±10%, 500 v., (V221 demod. filter)
C364		722002-123	Capacitor, mica, 100 mmf, ±10%, 500 v., (V221 demod. filter)
C365	71-31081	8887706-152	Capacitor, electrolytic, 2 mf, +20% -10%, 100 v., (AGC "slow" capacitor, S205)
C366	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (AGC filter, S205)
C367			Not used
C368			Not used
C369			Not used
C370	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V222 squelch diode input)
C371	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V222 AGC diode input)
C372*	71-31018	990167-17	Capacitor, disc ceramic, .0047 mf -0% +100%, 500 v., (V223 grid coupling)
C373	71-31001	727851-131	Capacitor, mica, 220 mmf, ±10%, 500 v., (V221 demod. filter)
C374	71-31018	990167-17	Capacitor, disc ceramic, .0047 mf -0% +100%, 500 v., (V223 cathode bypass)
C375	71-31021	990167-113	Capacitor, disc ceramic, 1000 mmf, ±20%, 500 v., (V223 AF ampl. output filter)
C376	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V223 AF ampl. output coupling)
C377	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V222 AGC diode cathode bypass)
C378	71-30964	340638-6	Capacitor, disc ceramic, .05 mf, +80% -20%, 500 v., (V222 squelch diode cathode bypass)
C379	71-30919	95695-29	Capacitor, electrolytic, 20 mf +50% -10%, 450 v., (V223 squelch triode bypass)
C380	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V223 squelch triode bypass)
C381*	71-30963	340638-5	Capacitor, disc ceramic, .04 mf +80% -20%, 500 v., (V223 squelch triode bypass)
C382	71-30963	340638-5	Capacitor, disc ceramic, .04 mf +80% -20%, 500 v., (V223 squelch triode grid bypass)
C383	71-30964	340638-6	Capacitor, disc ceramic, .05 mf +80% -20%, 500 v., (E201 thermostat bypass)
C384	71-30964	340638-6	Capacitor, disc ceramic, .05 mf +80% -20%, 500 v., (E202 thermostat bypass)

SSB-1 MARK IV - TRANSMITTER/RECEIVER SECTION

Symbol	Stock No.	Drawing No.	Description
C385	71-30964	340638-6	Capacitor, disc ceramic, .05 mf +80% -20%, 500 v., (E203 thermostat bypass)
C386	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V211 plate filter)
C387	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V212 plate filter)
C388	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (V210B plate bypass)
C389*			Capacitor, 15 mmf ±5%, 600 v., NPO. Erie type TCO 15 (FL201 coupling)
C390			Capacitor, 15 mmf ±5%, 600 v. NPO. Erie type TCO 15 (FL201 coupling)
C391		722004-519	Capacitor, mica, 68 mmf ±2% 500 v., (FL201 tuning)
C392		990167-8	Capacitor, disc ceramic, 150 mmf -0% +100%, 500 v., (V210A grid bypass)
			DIODES
CR201*	71-31049	1043175-1	Diode, germanium, RCA type 1N34A (Meter rectifier, IPA tuning)
CR202	71-31049	1043175-1	Diode, germanium, RCA type 1N34A (V211, output level equalizer)
CR203	71-31049	1043175-1	Diode, germanium, RCA type 1N34A (V211, output level equalizer)
CR204*		1043176-2	Diode, silicon, 1N2070. Texas Instrument #904 (Noise limiter)
CR205		1043176-2	Diode, silicon, 1N2070. Texas Instrument #904 (Noise limiter)
CR206		1043176-2	Diode, silicon, 1N2070. Texas Instrument #904 (Noise limiter)
CR207		1043176-2	Diode, silicon, 1N2070. Texas Instrument #904 (Noise limiter)
			INDICATORS
DS201*	71-31043	1043165-1	Dial light, neon, red. Omniglow type 1010A1 ("ON" indicator)
XDS201	71-31043	1043165-1	Socket, "TRANSMIT" lamp (DS201)
			SIDEBAND FILTER
FL201		1581122-1	Crystal filter. Snelgrove type F-250-1-U, (Sideband filter)
			JACKS
J201		727215-3	Connector, Amphenol type 83-1R (Antenna connector)
			RELAYS
K201*	71-31084		Relay, DPDT, coil 5000 ohms, 85 v. DC. Advance type 3868Y (Antenna changeover & B-plus switching)
K202	71-31084		Relay, DPDT, coil 5000 ohms, 85 v. DC. Advance type 3868Y (External muting and transmitter cut-off)
			INDUCTORS
L201	71-31085	1216617-2	Inductance, 22 microhenries (antenna coupling)
L202	71-31086	1216617-1	Inductance, 12 microhenries (PA tuning)
L203*	71-30971	347304-501	Inductor, channel 1 (RF ampl. grid)
L204	71-30971	347304-501	Inductor, channel 2 (RF ampl. grid)
L205*	71-30972	347304-502	Inductor, channel 3 (RF ampl. grid)
L206	71-30972	347304-502	Inductor, channel 4 (RF ampl. grid)
L207*	71-30974	347304-504	Inductor, channel 1 (V214 plate)
L208	71-30974	347304-504	Inductor, channel 2 (V214 plate)
L209*	71-30975	347304-505	Inductor, channel 3 (V214 plate)
L210	71-30975	347304-505	Inductor, channel 4 (V214 plate)
L211	71-31072	1044410-501	Inductance, 155 microhenries (PA plate choke)
L212*	71-31074	1044546-502	Inductance, 1.5 - 7.5 microhenries, channel 4 (IPA plate, V205)
L213	71-31074	1044546-502	Inductance, 1.5 - 7.5 microhenries, channel 3 (IPA plate, V205)
L214*	71-31075	1044546-501	Inductance, 7.5 - 37.5 microhenries, channel 2 (IPA plate, V205)
L215	71-31075	1044546-501	Inductance, 7.5 - 37.5 microhenries, channel 1 (IPA plate, V205)

Symbol	Stock No.	Drawing No.	Description
L216*	71-31080	8886161-14	Inductance, 1.0 millihenry. National type R50 (IPA plate choke, V205)
L217*	71-31056	1043280-501	Inductance (PA plate suppressor, V201)
L218	71-31056	1043280-501	Inductance (PA plate suppressor, V202)
L219	71-31056	1043280-501	Inductance (PA plate suppressor, V203)
L220			Not used.
L221	71-31087	1216618-2	Inductance, 5 microhenries, with 0.5 microhenry link (V207 output tuning)
L222	71-31073	1216618-1	Inductance, 22 microhenries, with 6 microhenry link (V207 output tuning)
L223	71-31080	8886161-14	Inductance, 1.0 millihenry. National type R50 (V211 screen RF choke)
L224	71-30970		Inductance, 1.25 microhenry (V211 screen)
METER			
M201	71-31113	1043630-1	Meter, 0-200 microamperes
CONNECTORS			
P201		1043181-2	Connector, plug, high voltage. James Millen Mfg. Co. No. 37001-C
RESISTORS			
R201*	71-30911	90496-82	Resistor, composition, 47,000 ohms, ±10%, 1 watt (static discharge)
R202	71-31116	112670-21	Resistor, wire wound, 0.21 ohms, ±2%, 2 w., (meter shunt, PA tuning)
R203*	71-31117	90496-48	Resistor, composition, 68 ohms, ±10%, 1·3., (PA parasitic suppressor)
R204	71-31117	90496-48	Resistor, composition, 68 ohms, ±10%, 1 w., (PA parasitic suppressor)
R205	71-21117	90496-48	Resistor, composition, 68 ohms, ±10%, 1 w., (PA parasitic suppressor)
R206*	71-30883	82283-76	Resistor, composition, 15,000 ohms, ±10%, ½ w., (V204 series resistor)
R207*	71-30892	82283-90	Resistor, composition, 220,000 ohms, ±10%, ½ w., (V204 series resistor)
R208	71-30905	90496-70	Resistor, composition, 4700 ohms, ±10%, 1 w., (IPA parasitic suppressor)
R209*	71-30877	82283-62	Resistor, composition, 1000 ohms, ±10%, ½ w., (PA grid swamping)
R210*	71-30906	90496-73	Resistor, composition, 8200 ohms, ±10%, 1 w., (V205 screen)
R211*	71-31088	90496-52	Resistor, composition, 150 ohms, ±10%, 1 w., (V205 cathode)
R212	71-31118	82283-75	Resistor, composition, 12,000 ohms, ±10%, ½ w., (V212 voltage divider)
R213*	71-30882	82283-74	Resistor, composition, 10,000 ohms, ±10%, ½ w., (V205 grid)
R214	71-30906	90496-73	Resistor, composition, 8200 ohms, ±10%, 1 w., (V206 screen dropping)
R215	71-30903	90496-61	Resistor, composition, 820 ohms, ±10%, 1 w., (V206 plate load)
R216	71-31088	90496-52	Resistor, composition, 150 ohms, ±10%, 1 w., (V206 cathode)
R217	71-30882	82283-74	Resistor, composition, 10,000 ohms, ±10%, ½ w., (V206 grid)
R218	71-30877	82283-62	Resistor, composition, 1000 ohms, ±10%, ½ w., (V208 cathode)
R219*	71-30907	90496-74	Resistor, composition, 10,000 ohms, 1 w., (V207 plate load)
R220	71-31089	82283-156	Resistor, composition, 750 ohms, ±5%, ½ w., (V206 grid input)
R221*	71-30895	82283-94	Resistor, composition, 470,000 ohms, ±10%, ½ w., (V207 grid)
R222	71-30895	82283-94	Resistor, composition, 470,000 ohms, ±10%, ½ w., (V207 grid)
R223	71-30877	82283-62	Resistor, composition, 1000 ohms, ±10%, ½ w., (V207 cathode)
R224*	71-31109		Resistor, variable, 50,000 ohms, ½ w., Linear Taper. Mallory LC50MP (V208 balance control)
R225	71-30907	90496-74	Resistor, composition, 10,000 ohms, ±10%, 1 w., (V208 plate, series)
R226		990185-457	Resistor, fixed, film, 38,300 ohms, ±1% (meter, series)
R227			Not used
R228	71-30895	82283-94	Resistor, composition, 470,000 ohms, ±10%, ½ w., (V208 grid)
R229	71-30895	82283-94	Resistor, composition, 470,000 ohms, ±10%, ½ w., (V208 grid)
R230	71-30882	82283-74	Resistor, composition, 10,000 ohms, ±10%, ½ w., (V208 grid)
R231*	71-30887	82283-82	Resistor, composition, 47,000 ohms, ±10%, ½ w., (filteroutput series resistor)
R232	71-30091	82283-96	Resistor, composition, 680,000 ohms, ±10%, ½ w., (carrier In-Out resistor)
R233	71-30883	82283-76	Resistor, composition, 15,000 ohms, ±10%, ½ w., (V209 plate isolation)
R234	71-30883	82283-76	Resistor, composition, 15,000 ohms, ±10%, ½ w., (V209 plate isolation)
R235	71-30907	90496-74	Resistor, composition, 10,000 ohms, ±10%, 1 w., (V209 plate decoupling)

SSB-1 MARK IV - TRANSMITTER/RECEIVER SECTION

Symbol	Stock No.	Drawing No.	Description
R236	71-30887	82283-82	Resistor, composition, 47,000 ohms, ±10%, ½ w., (V217 output isolation)
R237	71-30887	82283-82	Resistor, composition, 47,000 ohms, ±10%, ½ w., (V217 output isolation)
R238	71-30882	82283-74	Resistor, composition, 10,000 ohms, ±10%, ½ w., (V217 plate decoupling)
R239	71-30887	82283-82	Resistor, composition, 47,000 ohms, ±10%, ½ w., (V217 plate series)
R240	71-30887	82283-82	Resistor, composition, 47,000 ohms, ±10%, ½ w., (V217 plate series)
R241*	71-30885	82283-79	Resistor, composition, 27,000 ohms, ±10%, ½ w., (V209 plate series)
R242	71-31110		Resistor, variable, 20,000 ohms, ½ w., Linear Taper. Mallory type LC50 MP (V209 balance control)
R243	71-30885	82283-79	Resistor, composition, 27,000 ohms, ±10%, ½ w., (V209 plate, series)
R244	71-30880	82283-65	Resistor, composition, 1800 ohms, ±10%, ½ w.
R245	71-30877	82283-62	Resistor, composition, 1000 ohms, ±10%, ½ w., (V217 cathode)
R246	71-30887	82283-82	Resistor, composition, 47,000 ohms, ±10%, ½ w., (V217 grid input)
R247	71-30887	82283-82	Resistor, composition, 47,000 ohms, ±10%, ½ w., (V217 grid input)
R248*	71-30872	82283-84	Resistor, composition, 68,000 ohms, ±10%, ½ w., (V209 grid)
R249	71-30872	82283-84	Resistor, composition, 68,000 ohms, ±10%, ½ w., (V209 grid)
R250	71-30892	82283-90	Resistor, composition, 220,000 ohms, ±10%, ½ w., (V209 grid isolation)
R251*	71-30896	82283-97	Resistor, composition, 820,000 ohms, ±10%, ½ w., (V209 grid bias)
R252	71-30896	82283-97	Resistor, composition, 820,000 ohms, ±10%, ½ w., (V209 grid bias)
R253	71-30892	82283-90	Resistor, composition, 220,000 ohms, ±10%, ½ w., (V209 grid isolation)
R254	71-30887	82283-82	Resistor, composition, 47,000 ohms, ±10%, ½ w., (V210 plate load)
R255*	71-30878	82283-63	Resistor, composition, 1200 ohms, ±10%, ½ w., (V210 cathode)
R256	71-30887	82283-82	Resistor, composition, 47,000 ohms, ±10%, ½ w., (V210 cathode)
R257*	71-31093	124969-6	Resistor, variable, 250,000 ohms, 1/4 w., Linear Taper. (V210 gain control)
R258*	71-30891	82283-88	Resistor, composition, 150,000 ohms, ±10%, ½ w., (DS201 series)
R259*	71-30889	82283-86	Resistor, composition, 100,000 ohms, ±10%, ½ w., (V210 grid bias)
R301	71-30922	99126-55	Resistor, composition, 270 ohms, ±10%, 2 w., (Ant. loading)
R302	71-30889	82283-86	Resistor, composition, 100,000 ohms, ±10%, ½ w., (V214 AGC isolation)
R303*	71-30874	82283-54	Resistor, composition, 220 ohms, ±10%, ½ w., (V214 cathode)
R304	71-30911	90496-82	Resistor, 47,000 ohms, ±10%, 1 w., (V214 screen dropping)
R305	71-30907	90496-74	Resistor, composition, 10,000 ohms, ±10%, ½ w., (V214 plate decoupling)
R306	71-30889	82283-86	Resistor, composition, 100,000 ohms, ±10%, ½ w., (V215 AGC)
R307	71-30895	82283-94	Resistor, composition, 470,000 ohms, ±10%, ½ w., (V215 AGC)
R308	71-30884	82283-78	Resistor, composition, 22,000 ohms, ±10%, ½ w., (V211 grid, channel 4)
R309	71-30884	82283-78	Resistor, composition, 22,000 ohms, ±10%, ½ w., (V211 grid, channel 3)
R310	71-30878	82283-63	Resistor, composition, 1200 ohms, ±10%, ½ w., (V211, swamping for L224)
R311	71-30887	82283-82	Resistor, composition, 47,000 ohms, ±10%, ½ w., (V211 grid, channel 2)
R312	71-30887	82283-82	Resistor, composition, 47,000 ohms, ±10%, ½ w., (V211 grid, channel 1)
R313*	71-30926	99126-78	Resistor, composition, 22,000 ohms, ±10%, 2 w., (V211 plate dropping)
R314	71-30926	99126-78	Resistor, composition, 22,000 ohms, ±10%, 2 w., (V211 plate dropping)
R315	71-30887	82283-82	Resistor, composition, 47,000 ohms, ±10%, ½ w., (V215 grid bias)
R316	71-30874	82283-54	Resistor, composition, 220 ohms, ±10%, ½ w., (V215 cathode)
R317	71-31010		Resistor, variable, 5000 ohms, 2 w. Taper 11. Mallory R5MP (V215, 216 squelch)
R318	71-30925	99126-76	Resistor, composition, 15,000 ohms, ±10%, 2 w., (CR202, CR203 voltage divider)
R319	71-30877	82283-62	Resistor, composition, 1000 ohms, ±10%, ½ w., (CR202, CR203 voltage divider)
R320*	71-30910	90496-78	Resistor, composition, 22,000 ohms, ±10%, 1 w., (V215 screen)
R321	71-30889	82283-86	Resistor, composition, 100,000 ohms, ±10%, ½ w., (V215 AGC)
R322*	71-30881	82283-66	Resistor, composition, 2200 ohms, ±10%, ½ w., (V215 plate decoupling)
R323	71-30889	82283-86	Resistor, composition, 100,000 ohms, ±10%, ½ w., (V216 AGC isolation)
R324	71-30887	82283-82	Resistor, composition, 47,000 ohms, ±10%, ½ w., (V216 grid bias)
R325	71-30886	82283-81	Resistor, composition, 39,000 ohms, ±10%, ½ w., (V312 screen)
R326	71-30873	82283-53	Resistor, composition, 180 ohms, ±10%, ½ w., (V216 cathode)
R327	71-30906	90496-73	Resistor, composition, 8200 ohms, ±10%, 1 w., (V312 plate series)
R328	71-30908	90496-75	Resistor, composition, 12,000 ohms, ±10%, 1 w., (V312 plate decoupling)
R329	71-30910	90496-78	Resistor, composition, 22,000 ohms, ±10%, 1 w., (V216 screen)
R330	71-30889	82283-86	Resistor, composition, 100,000 ohms, ±10%, ½ w., (V312 grid)
R331*	71-30897	82283-98	Resistor, composition, 1 megohm, ±10%, ½ w., (V312 grid)

Symbol	Stock No.	Drawing No.	Description
R332	71-30881	82283-66	Resistor, composition, 2200 ohms, ±10%, ½ w., (V216 plate decoupling)
R333	71-30889	82283-86	Resistor, composition, 100,000 ohms, ±10%, ½ w., (V215, V216 AGC)
R334	71-30889	82283-86	Resistor, composition, 100,000 ohms, ±10%, ½ w., (V218 AGC isolation)
R335	71-30889	82283-86	Resistor, composition, 100,000 ohms, ±10%, ½ w., (V218 grid)
R336	71-30874	82283-54	Resistor, composition, 220 ohms, ±10%, ½ w., (V218 cathode)
R337	71-30897	82283-98	Resistor, composition, 1 meghohm, ±10%, ½ w., (V213 grid)
R338	71-30889	82283-86	Resistor, composition, 100,000 ohms, ±10%, ½ w., (V213 grid)
R339	71-30889	82283-86	Resistor, composition, 100,000 ohms, ±10%, ½ w., (V213 screen)
R340	71-30906	90496-73	Resistor, composition, 8200 ohms, ±10%, 1 w., (V213 plate series)
R341	71-30887	82283-82	Resistor, composition, 47,000 ohms, ±10%, ½ w., (V218 screen)
R342	71-30881	82283-66	Resistor, composition, 2200 ohms, ±10%, ½ w., (V218 plate decoupling)
R343	71-30897	82283-98	Resistor, composition, 1 meghohm, ±10%, ½ w., (V219 AGC isolation)
R344	71-30895	82283-94	Resistor, composition, 470,000 ohms, ±10%, ½ w., (V219 grid)
R345*	71-30888	82283-85	Resistor, composition, 82,000 ohms, ±10%, ½ w., (V220 grid)
R346	71-30881	82283-66	Resistor, composition, 2200 ohms, ±10%, ½ w., (V220 plate decoupling)
R347	71-30874	82283-54	Resistor, composition, 220 ohms, ±10%, ½ w., (V220 cathode)
R348	71-30877	82283-62	Resistor, composition, 1000 ohms, ±10%, ½ w., (V219 cathode)
R349	71-30887	82283-82	Resistor, composition, 47,000 ohms, ±10%, ½ w., (V220 screen)
R350	71-30887	82283-82	Resistor, composition, 47,000 ohms, ±10%, ½ w., (V219 screen)
R351	71-30881	82283-66	Resistor, composition, 2200 ohms, ±10%, ½ w., (V219 plate decoupling)
R352	71-30891	82283-88	Resistor, composition, 150,000 ohms, ±10%, ½ w., (V213 plate)
R353*	71-30893	82283-91	Resistor, composition, 270,000 ohms, ±10%, ½ w., (V221 demod. filter)
R354	71-30889	82283-86	Resistor, composition, 100,000 ohms, ±10%, ½ w., (V221 demod. audio divider)
R355	71-30890	82283-87	Resistor, composition, 120,000 ohms, ±10%, ½ w., (V221 demod. audio divider)
R356			Not used
R357			Not used
R358			Not used
R359	71-30891	82283-88	Resistor, composition, 150,000 ohms, ±10%, ½ w.
R360	71-30895	82283-94	Resistor, composition, 470,000 ohms, ±10%, ½ w.
R361	71-30895	82283-94	Resistor, composition, 470,000 ohms, ±10%, ½ w., (V222 AGC diode plate)
R362	71-30892	82283-90	Resistor, composition, 220,000 ohms, ±10%, ½ w., (V223 AF ampl. grid)
R363	71-30891	82283-88	Resistor, composition, 150,000 ohms, ±10%, ½ w., (V222 AGC diode, voltage divider)
R364	71-30887	82283-82	Resistor, composition, 47,000 ohms, ±10%, ½ w., (V222 AGC diode, cathode)
R365	71-30911	90496-82	Resistor, composition, 47,000 ohms, ±10%, 1 w., (V222 squelch diode, voltage divider)
R366	71-30882	82283-74	Resistor, composition, 10,000 ohms, ±10%, ½ w., (V222 squelch diode, cathode)
R367	71-30892	82283-90	Resistor, composition, 220,000 ohms, ±10%, ½ w., (V223 AF ampl. audio isolation)
R368	71-30945	124969-5	Resistor, variable, 250,000 ohms (V223 AF ampl. line level control)
R369	71-30881	82283-66	Resistor, composition, 2200 ohms, ±10%, ½ w., (V223 AF ampl. cathode)
R370	71-30891	82283-88	Resistor, composition, 150,000 ohms, ±10%, ½ w., (V223 AF ampl. plate decoupling)
R371	71-30884	82283-78	Resistor, composition, 22,000 ohms, ±10%, ½ w., (V223 squelch triode, plate decoupling)
R372	71-30892	82283-90	Resistor, composition, 220,000 ohms, ±10%, ½ w., (V223 squelch triode grid)
R373	71-30898	82283-100	Resistor, composition, 1.5 megohms, ±10%, ½ w., (V223 squelch triode grid)
R374	71-30882	82283-74	Resistor, composition, 10,000 ohms, ±10%, ½ w., (V210B, Rec. muting)
R375	71-30888	82283-85	Resistor, composition, 82,000 ohms, ±10%, ½ w., (V216, T207, input swamping)
R376	71-30892	82283-90	Resistor, composition, 220,000 ohms, ±10%, ½ w.
R377	71-30897	82283-98	Resistor, composition, 1 megohm, ±10%, ½ w.

SSB-1 MARK IV - TRANSMITTER/RECEIVER SECTION

Symbol	Stock No.	Drawing No.	Description
		SWITCHES	
S201A, B, C	71-31064	1044281-1	Switch, rotary, 3-section, 4-position (Channel selector, Antenna, PA)
S201D, E, F	71-31071	1044288-1	Switch, rotary, 3-section, 4-position (Channel selector, IPA, 3rd Bal. Mod.)
S201G, H, I, J	71-31063	1044280-1	Switch, rotary, 4-section, 4-position (Channel selector, Osc & Rec.)
S201K	71-31065	1044282-1	Switch, rotary, 1-section, 4-position (Remote indicator, auxiliary)
S202	71-30952	330946-2	Switch, rotary (Carrier "IN-OUT")
S203	71-31070	1044287-1	Switch, rotary, 2-section, 5-position (meter switch)
S204	71-31069	1044286-1	Switch, rotary, 1-section, 2-position (Sideband Selector)
S205	71-30961	338480-7	Switch, rotary (AGC)
S206	71-30960	338480-6	Switch, rotary (Noise Limiter)
		TRANSFORMERS	
T201*	71-31111	1041509-1	Transformer, IF, 1400 kc. Automatic Mfg. Corp. type (M1-409K) 1500-1. (2nd Bal. Mod. output)
T202*	71-31032	1041509-2	Transformer, IF, 250 kc. Automatic Mfg. Corp. type 1655-14. (2nd Bal. Mod. input)
T203	71-31111	1041509-1	Transformer, IF, 1400 kc. Automatic Mf. Corp. type (M1-409K) 1500-1. (1st & 2nd mixer interstage)
T204	71-31032	1041509-2	Transformer, IF, 250 kc. Automatic Mfg. Corp. type 1655014. (2nd & 3rd IF interstage)
T205*	71-31032	1041509-2	Transformer, IF, 250 kc. Automatic Mfg. Corp. type 1655-14. (AGC plate)
T206	71-31032	1041509-2	Transformer, IF, 250 kc. Automatic Mfg. Corp. type 1655-14. (3rd IF output)
T207	71-31032	1041509-2	Transformer, IF, 250 kc. Automatic Mfg. Corp. type 1655-14. (2nd Mixer output)
		TERMINAL BOARDS	
TB201	71-31040	1041553-1	Terminal board. Cinch # 1755. (Rec. Ant. input)
TB202	71-30978	430764-4	Terminal board. H. B. Jones #5-140. (Remote Indicator Terminals)
TB203	71-31083	8893711-6	Terminal board. Cinch #1766. (Ext. AGC, Rec. Mute, Int. Rec.Mute)
		JACKS	
TP201*	71-31076	8825493-2	Jack, red. Johnson #105-602-1 (V207 input test)
TP202	71-31076	8825493-2	Jack, red. Johnson #105-602-1 (V208 1150-1650 kc input test)
TP203	71-31076	8825493-2	Jack, red. Johnson #105-602-1 (V209 250 kc input test)
TP204	71-31076	8825493-2	Jack, red. Johnson #105-602-1 (V215 1st mixer grid test)
TP205	71-31076	8825493-2	Jack, red. Johnson #105-602-1 (V216 2nd mixer grid test)
		TUBE SOCKETS	
XV201*	71-30942	99391-2	Socket, tube, octal
XV202	71-30942	99391-2	Socket, tube, octal
XV203	71-30942	99391-2	Socket, tube, octal
XV204*	71-31007	737867-20	Socket, tube, 7-pin miniature
XV205*	71-31008	737870-20	Socket, tube, 9-pin miniature
XV206	71-31008	737870-20	Socket, tube, 9-pin miniature
XV207	71-31008	737870-20	Socket, tube, 9-pin miniature
XV208	71-31008	737870-20	Socket, tube, 9-pin miniature
XV209	71-31008	737870-20	Socket, tube, 9-pin miniature
XV210	71-31008	737870-20	Socket, tube, 9-pin miniature
XV211	71-31008	737870-20	Socket, tube, 9-pin miniature

SSB-1 MARK IV - TRANSMITTER/RECEIVER SECTION

Symbol	Stock No.	Drawing No.	Description
XV212	71-31007	737867-20	Socket, tube, 7-pin miniature
XV213	71-31007	737867-20	Socket, tube, 7-pin miniature
XV214	71-31007	737867-20	Socket, tube, 7-pin miniature
XV215	71-31007	737867-20	Socket, tube, 7-pin miniature
XV216	71-31007	737867-20	Socket, tube, 7-pin miniature
XV217	71-31007	737867-20	Socket, tube, 7-pin miniature
XV218	71-31007	737867-20	Socket, tube, 7-pin miniature
XV219	71-31007	737867-20	Socket, tube, 7-pin miniature
XV220	71-31007	737867-20	Socket, tube, 7-pin miniature
XV221	71-31007	737867-20	Socket, tube, 7-pin miniature
XV222	71-31007	737867-20	Socket, tube, 7-pin miniature
XV223	71-31008	737870-20	Socket, tube, 9-pin miniature
TUBES			
V201			Tube, electron, RCA type 6146 (Power amplifier)
V202			Tube, electron, RCA type 6146 (Power amplifier)
V203			Tube, electron, RCA type 6146 (Power amplifier)
V204			Tube, electron, RCA type 6AL5 (Modulation rectifier)
V205			Tube, electron, RCA type 6CL6 (Intermediate power amplifier)
V206			Tube, electron, RCA type 6CL6 (Intermediate power amplifier)
V207			Tube, electron, RCA type 12AT7 (3rd Balanced Modulator)
V208			Tube, electron, RCA type 12AT7 (2nd Balanced Modulator)
V209			Tube, electron, RCA type 12AX7 (Balanced Modulator)
V210			Tube, electron, RCA type 12AX7 (Audio amplifier)
V211			Tube, electron, RCA type 6CL6 (4.4-16.4 mc Osc)
V212			Tube, electron, RCA type 6BE6 (1150-1650 kc Osc)
V213			Tube, electron, RCA type 6BE6 (250 kc Osc)
V214			Tube, electron, RCA type 6BA6 (RF amplifier)
V215			Tube, electron, RCA type 6BE6 (1st mixer)
V216			Tube, electron, RCA type 6BE6 (2nd mixer)
V217			Tube, electron, RCA type 12AX7 (1st IF amplifier)
V218			Tube, electron, RCA type 6BA6 (2nd IF amplifier)
V219			Tube, electron, RCA type 6BA6 (3rd IF amplifier)
V220			Tube, electron, RCA type 6BA6 (AGC amplifier)
V221			Tube, electron, RCA type 6AL5 (Demodulator)
V222			Tube, electron, RCA type 6AL5 (AGC diode, Squelch diode)
V223			Tube, electron, RCA type 12AT7 (AF amplifier, Squelch triode)
CRYSTALS			
Y201			Crystal, type CR-27/U (order by frequency) channel 1
Y202			Crystal, type CR-27/U (order by frequency) channel 2
Y203			Crystal, type CR-27/U (order by frequency) channel 3
Y204			Crystal, type CR-27/U (order by frequency) channel 4
Y205		1041511-2	Crystal, 1150 kc. (CR-27/U)
Y206		1041511-3	Crystal, 1650 kc. (CR-27/U)
Y207		1041511-4	Crystal, 250 kc. (CR-46/U)
CRYSTAL OVENS			
E201*	71-31112	1041510-1	Crystal oven and holder, 75 deg. C. ±1 deg.
E202	71-31112	1041510-1	Crystal oven and holder, 75 deg. C. ±1 deg.
E203	71-31112	1041510-1	Crystal oven and holder, 75 deg. C. ±1 deg.
CRYSTAL SOCKETS			
XE201	71-30942	9939-12	Socket, octal
XE202	71-30942	99391-2	Socket, octal
XE203	71-30942	99391-2	Socket, octal
XE204		8885952-1	Socket, crystal

SSB-1 MARK IV - POWER SUPPLY SECTION

Symbol	Stock No.	Drawing No.	Description
			CAPACITORS
C101	71-31019	990167-19	Capacitor, ceramic disc, .01 mf -0% +100%, 500 v. (Plate coupling, V101A)
C102	71-31019	990167-19	Capacitor, ceramic disc, .01 mf -0% +100%, 500 v.(Plate coupling, V101A)
C103	71-31019	990167-19	Capacitor, ceramic disc, .01 mf -0% +100%, 500 v. (Grid coupling, V101A)
C104	71-31019	990167-19	Capacitor, ceramic disc, .01 mf -0% +100%, 500 v. (VOK input, V102)
C105	71-31019	990167-19	Capacitor, ceramic disc, .01 mf -0% +100%, 500 v. (Speech clipper coupling, V101B)
C106	71-31019	990167-19	Capacitor, ceramic disc, .01 mf -0% +100%, 500 v. (Screen bypass V101B)
C107			Not used
C108	71-30989	72202-109	Capacitor, mica, 27 mmf ±10%, 500 v. JAN CM20B270K (Tone osc. coupling, V103A)
C109	71-30998	822018-155	Capacitor, mica, 2200 mmf ±10%, 500 v. (Tone osc. waveshaping, V103A)
C110	71-31011	936625-1	Capacitor, ceramic disc, .01 mf ±20%, 500 v. (Grid bypass, V101B)
C111	71-31019	990167-19	Capacitor, ceramic disc, .01 mf -0% +100%, 500 v. (Audio coupling, V101B)
C112*	71-30992	722002-137	Capacitor, mica, 390 mmf ±10%, 500 v. (Tone osc. freq. capacitor, V103A)
C113	71-30992	722002-137	Capacitor, mica, 390 mmf ±10%, 500 v. (Tone osc. freq. capacitor, V103A)
C114	71-30992	722003-137	Capacitor, mica, 390 mmf ±10%, 500 v. (Tone osc. freq. capacitor, V103A)
C115	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v., (Key bypass, V103A)
C116	71-30920		Capacitor, electrolytic, 50 mf, 150 v. Mallory type TC49 (Relay delay)
C117*	71-30984	442900-99	Capacitor, electrolytic, 125 mf -10% +40%, 450 WVDC, with cardboard insulating tube. (HV filter)
C118	71-30984	442900-99	Capacitor, electrolytic, 125 mf -10% +40%, 450 WVDC, with cardboard insulating tube. (HV filter)
C119	71-30984	442900-99	Capacitor, electrolytic, 125 mf -10% +40%, 450 WVDC, with cardboard insulating tube. (HV filter)
C120	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v. (AC line bypass, TB101)
C121	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v. (AC line bypass, TB101)
C122	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v. (AC line bypass, TB101)
C123			Not used
C124	71-31042	1043027-3	Capacitor, electrolytic, 20 mf, 450 WVDC & 80 mf, 350 WVDC. (Common neg. LV filter)
C125			Not used
C126	71-31041	1043027-1	Capacitor, electrolytic, 300 mf, 150 WVDC (Bias supply filter)
C127	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v. (V105 bypass)
C128	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v. (K102 contact bypass)
C129		727865-155	Capacitor, mica, 2200 mmf ±10%, 500 v. (V106 plate bypass)
C130	71-30999	722027-163	Capacitor, mica, 4700 mmf ±10%, 500 v. (V107 plate bypass)
C131*	71-30985	44290156	Capacitor, electrolytic, 10 mf -10% +40%, 150 WVDC. Sprague type DEE (B-plus decoupling)
C132	71-30985	442901-56	Capacitor, electrolytic, 10 mf -10% +40%, 150 WVDC. Sprague type DEE (B-plus decoupling)

SSB-1 MARK IV - POWER SUPPLY SECTION

Symbol	Stock No.	Drawing No.	Description
C133			Not used
C134			Not used
C135	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v. (V103A plate-grid coupling)
C136	71-30985	442901-56	Capacitor, electrolytic, 10 mf -10% +40%, 150 WVDC. Sprague type DEE (Bias filter)
C137			Not used
C138	71-31019	990167-19	Capacitor, disc ceramic, .01 mf -0% +100%, 500 v. (Audio coupling V106)
C139	71-31020	990167-111	Capacitor, disc ceramic, 470 mmf ±20%, 500 v.
DIODES			
CR101			Not used
CR102*		1043176-5	Diode, silicon. Transitron type 1N2071
CR103		1043176-5	Diode, silicon. Transitron type 1N2071
CR104		1043176-5	Diode, silicon. Transitron type 1N2071
CR105		1043176-5	Diode, silicon. Transitron type 1N2071
CR106		1043176-5	Diode, silicon. Transitron type 1N2071
CR107		1043176-2	Diode, silicon, 1N2070. Texas Instrument #904 (meter rectifier)
CR108		1043176-5	Diode, silicon. Transitron type 1N2071
CR109		1043176-5	Diode, silicon. Transitron type 1N2071
CR110		1043176-5	Diode, silicon. Transitron type 1N2071
CR111		1043176-5	Diode, silicon. Transitron type 1N2071
CR112		1043176-5	Diode, silicon. Transitron type 1N2071
CR113		1043176-5	Diode, silicon. Transitron type 1N2071
CR114		1043176-5	Diode, silicon. Transitron type 1N2071
CR115		1043176-5	Diode, silicon. Transitron type 1N2071
CR116		1043176-5	Diode, silicon. Transitron type 1N2071
CR117		1043176-5	Diode, silicon. Transitron type 1N2071
CR118		1043176-5	Diode, silicon. Transitron type 1N2071
CR119		1043176-5	Diode, silicon. Transitron type 1N2071
CR120		1043176-5	Diode, silicon. Transitron type 1N2071
CR121		1043176-5	Diode, silicon. Transitron type 1N2071
CR122		1043176-5	Diode, silicon. Transitron type 1N2071
CR123		1043176-5	Diode, silicon. Transitron type 1N2071
CR124		1043176-5	Diode, silicon. Transitron type 1N2071
CR125		1043176-5	Diode, silicon. Transitron type 1N2071
CR126		1043176-5	Diode, silicon. Transitron type 1N2071
INDICATORS			
DS101	71-31043	1043165-1	Dial light, neon, red. Omniglow type 1010A1 (Transmitter "ON" indicator)
DS102	71-31044	1043165-3	Dial light, neon, amber. Omniglow type 1010A3 (Receiver "ON" indicator)
DS103*	71-31045	1043165-4	Dial light, neon, white. Omniglow type 1010A4 (Power "ON" indicator)
DS104	71-31045	1043165-4	Dial light, neon, white. Omniglow type 1010A4 (Remote desk set #3 indicator)
DS105	71-31045	1043165-4	Dial light, neon, white. Omniglow type 1010A4 (Remote desk set #2 indicator)
DS106	71-31045	1043165-4	Dial light, neon, white. Omniglow type 1010A4 (Remote desk set #1 indicator)
DS107	71-31045	1043165-4	Dial light, neon, white. Omniglow type 1010A4 ("LINE" indicator)
DS108	71-30948	127383-5	Buzzer, 48 v. DC. Edwards type #15, size 1 (modified) (Local operator buzzer)

SSB-1 MARK IV - POWER SUPPLY SECTION

Symbol	Stock No.	Drawing No.	Description
			FUSES
F101	71-31090	990157-113	Fuse, 5A., 125 v., time-lag, 3AG, Slo-Blo (Main fuse)
XF101	71-31077	8875711-6	Fuse holder
F102	71-31091	990157-111	Fuse, 3A., 125 v., time-lag, 3AG, Slo-Blo (HV power supply)
F103	71-30943	112513-9	Fuse, 1A., 125 v., time-lag, 3AG, Slo-Blo (LV power supply)
F104	71-31119	990157-107	Fuse, .75A, 250 v., 3AG (Filament trans. fuse)
F105	71-31013	990157-6	Fuse, .5A., 250 v., 3AG (Crystal oven & keying relay fuse)
			HANDSET
HS101	71-31048	1043173-1	Handset assy.
			JACKS
J101	71-31046	1043170-1	Jack, telephone type, open circuit. Switchcraft type 11 (Key jack)
J102	71-30942	99391-2	Socket, tube type, octal (VOK-10 receptacle)
J103	71-31047	1043170-2	Jack, telephone type. Switchcraft type 13A (Headphone jack)
J104	71-31052	1043181-1	Safety terminal. James Millen Mfg. Corp. No. 37001D (High voltage lead)
J105	71-30942	99391-2	Socket, tube type, octal (Selective ringer receptacle)
			RELAYS
K101	71-31092	1043281-1	Relay, DPDT contacts, coil 6.3 v. AC 50/60 cps. Advance type GHA/2C/6VA. (Keying relay)
K102	71-31051	1043178-2	Relay, SPDT contacts, coil 10,000 ohms, 4.5 ma. Potter & Brumfield type LB-1228. (VOK/MANUAL relay)
			REACTORS
L101	71-31067	1044284-1	Reactor, filter, 2-12 henry, 80-250 ma. DC (HV filter)
L102	71-31068	1044285-1	Reactor, filter, 6 henry, 140 ma. DC (LV filter)
			LOUDSPEAKER
LS101	71-30957	337564-2	Loudspeaker, 3.5 ohms
			RESISTORS
R101	71-30911	90496-82	Resistor, composition, 47,000 ohms ±10%, 1 w. (V101A plate)
R102*	71-30904	90496-62	Resistor, composition, 1000 ohms ±10%, 1 w. (V101A cathode)
R103	71-30897	82283-98	Resistor, composition, 1 megohm ±10%, ½ w. (V101A grid)
R104	71-30896	82283-97	Resistor, composition, 820,000 ohms ±10%, ½ w. (V102 plate)
R105	71-30893	82283-91	Resistor, composition, 270,000 ohms ±10%, ½ w. (V102 plate)
R106	71-30889	82283-86	Resistor, composition, 100,000 ohms ±10%, ½ w. (V102 plate)
R107	71-30889	82283-86	Resistor, composition, 100,000 ohms ±10%, ½ w. (V102 cathode)
R108	71-30889	82283-86	Resistor, composition, 100,000 ohms ±10%, ½ w. (V102 cathode)
R109*	71-30912	90496-90	Resistor, composition, 220,000 ohms ±10%, 1 w. (V101B plate)
R110	71-30897	82283-98	Resistor, composition, 1 megohm ±10%, ½ w. (V101B screen)
R111	71-30904	90496-62	Resistor, composition, 1000 ohms ±10%, 1 w. (V101B cathode)
R112			Not used
R113			Not used
R114			Not used
R115	71-30897	82283-98	Resistor, composition, 1 megohm, ±10%, ½ w. (V101B grid)
R116	71-30904	90496-62	Resistor, composition, 1000 ohms ±10%, 1 w. (Bias divider)
R117	71-30907	90496-74	Resistor, composition, 10,000 ohms ±10%, 1 w. (Bias divider)
R118	71-30926	99126-78	Resistor, composition, 22,000 ohms ±10%, 2 w. (Bias decoupling)
R119	71-30907	90496-74	Resistor, composition, 10,000 ohms ±10%, 1 w. (Bias divider)
R120	71-30875	82283-58	Resistor, composition, 470 ohms ±10%, ½ w. (Relay delay)
R121	71-30881	82283-66	Resistor, composition, 2200 ohms ±10%, ½ w. (V103A cathode voltage divider)

SSB-1 MARK IV - POWER SUPPLY SECTION

Symbol	Stock No.	Drawing No.	Description
R122	71-30882	82283-74	Resistor, composition, 10,000 ohms ±10%, ½ w. (Cathode voltage divider)
R123	71-30895	82283-94	Resistor, composition, 470,000 ohms ±10%, ½ w. (V103A tuned circuit)
R124	71-30895	82283-94	Resistor, composition, 470,000 ohms ±10%, ½ w. (V103A tuned circuit)
R125	71-30895	82283-94	Resistor, composition, 470,000 ohms ±10%, ½ w. (V103A tuned circuit)
R126	71-30897	82283-98	Resistor, composition, 1 megohm ±10%, ½ w. (V103A grid)
R127			Not used
R128*	71-30949	182120-8	Resistor, wire wound, 7500 ohms, 25 w. Ohmite #0214 (HV bleeder)
R129	71-30949	182120-8	Resistor, wire wound, 7500 ohms, 25 w. Ohmite #0214 (HV bleeder)
R130	71-30949	182120-8	Resistor, wire wound, 7500 ohms 25 w. Ohmite #0214 (HV bleeder)
R131*	71-31022	990185-501	Resistor, fixed, film, 100,000 ohms ±1%, ½ w. (AC power line metering)
R132	71-30928	99126-81	Resistor, composition, 39,000 ohms ±10%, 2 w. (LV bleeder)
R133			Resistor, wire wound, adjustable, 3000 ohms, 25 w. Ohmite #0379 (B-plus 150 v. adj.)
R134			Not used
R135	71-31029		Resistor, wire wound, adjustable, 2000 ohms ±5%, 10 w. Ohmite #1026. (Neg. 85 v. adjust)
R136	71-31109		Resistor, variable, 50,000 ohms, linear taper, ½ w. Mallory LC50MP (Bias adjust)
R137	71-30946	124969-7	Resistor, variable, 1 megohm, linear taper, 1/4 w. (VOK sensitivity adj.)
R138	71-30947	124969-9	Resistor, variable, 1000 ohms, linear taper, 1/4 w. (LINE input level adj.)
R139	71-31093	124969-6	Resistor, variable, 250,000 ohms, linear taper, 1/4 w. (Speaker vol. control)
R140			Not used
R141			Not used
R142	71-30907	90496-74	Resistor, composition, 10,000 ohms ±10%, 1 w.
R143		82283-64	Resistor, composition, 1500 ohms ±10%, ½ w.
R144*	71-30901	90496-38	Resistor, composition, 10 ohms ±10%, 1 w. (Speaker/headphone load)
R145	71-30901	90496-38	Resistor, composition, 10 ohms ±10%, 1 w. (Speaker/headphone load)
R146	71-30902	90496-50	Resistor, composition, 100 ohms ±10%, 1 w. (Handset isolation)
R147	71-30892	82283-90	Resistor, composition, 220,000 ohms ±10%, ½ w. (Audio load)
R148	71-30904	90496-62	Resistor, composition, 1000 ohms ±10%, 1 w. (Bias divider)
R149	71-30892	82283-90	Resistor, composition, 220,000 ohms ±10%, ½ w. (Bias divider)
R150	71-30885	82283-79	Resistor, compsition, 27,000 ohms ±10%, ½ w.
R151	71-30891	82283-88	Resistor, composition, 150,000 ohms ±10%, ½ w.
R152	71-30912	90496-90	Resistor, composition, 220,000 ohms ±10%, 1 w. (V103A plate load)
R153	71-30899	82283-104	Resistor, composition, 3.3 megohms ±10%, ½ w. (V103A grid)
R154	71-30909	90496-76	Resistor, composition, 15,000 ohms ±10%, 1 w. (V106 plate decoupling)
R155*	71-30913	90496-156	Resistor, composition, 750 ohms ±5%, 1 w. (V106 cathode)
R156	71-30913	90496-156	Resistor, composition, 750 ohms ±5%, 1 w. (V107 cathode)
R157	71-30904	90496-62	Resistor, composition, 1000 ohms ±10%, 1 w. (Neg. 85 v. dropping resistor)
R158	71-30895	82283-94	Resistor, composition, 470,000 ohms ±10%, ½ w. (LINE audio isolation)
R159	71-30927	99126-80	Resistor, composition, 33,000 ohms ±10%, 2 w. (K102 series resistor)
R160	71-31022	990185-501	Resistor, fixed film, 100,000 ohms, ½ w. (AC power line metering)
R161 to R176			Not used
R177	71-30891	82283-88	Resistor, composition, 150,000 ohms ±10%, ½ w.
R178	71-30891	82283-88	Resistor, composition, 150,000 ohms ±10%, ½ w.
R179	71-30891	82283-88	Resistor, composition, 150,000 ohms ±10%, ½ w.
R180		82283-83	Resistor, composition, 56,000 ohms ±10%, ½ w.
R181	71-30889	82283-86	Resistor, composition, 100,000 ohms ±10%, ½ w.
SWITCHES			
S101	71-31028	990780-110	Switch, toggle, DPST. Cutler-Hammer type 7561K4 (POWER switch)
S102*	71-31026	990780-102	Switch, toggle, SPST. Cutler-Hammer type 7501K13 (RECEIVER switch)
S103	71-31026	990780-102	Switch, toggle, SPST. Cutler-Hammer type 7501K13 (TRANSMITTER switch)

SSB-1 MARK IV - POWER SUPPLY SECTION

Symbol	Stock No.	Drawing No.	Description
S104	71-30979	433779-3	Switch, tap, SPST. Ohmite type 111-5 (Power line switch)
S105*	71-31027	990780-109	Switch, toggle, DPDT. Cutler-Hammer type 7565K5 (TELEPHONE/ TELEGRAPH switch)
S106	71-31027	990780-109	Switch, toggle, DPDT. Cutler-Hammer type 7565K5 (MANUAL/VOK switch)
S107	71-31025	990780-101	Switch, toggle, SPDT. Cutler-Hammer type 7505K4 (SPKR/HANDSET switch)
S108	71-31058	1044252-1	Switch, rotary, 6-pole 3-position (MONITOR/INTERCOM/OPERATE switch)
S109	71-31057	1044251-1	Switch, rotary, 6-pole 5-position (LOCAL/REMOTE/LINE switch)
			TRANSFORMERS
T101*	71-31059	1044267-1	Transformer, filament. (Transmitter filaments)
T102	71-31060	1044268-1	Transformer, power. (HV plate supply)
T103	71-31062	1044271-1	Transformer, audio, 600-ohm line to 600-ohm load (600-ohm LINE input)
T104	71-31061	1044269-1	Transformer, power (LV power supply)
T105	71-31059	1044267-1	Transformer, filament (Receiver filaments)
T106	71-31066	1044283-1	Autotransformer 50/60 cps (AC line voltage adjustment)
T107	71-30970	344482-2	Transformer (Oven heater and relay supply)
T108	71-30954	337106-16	Transformer, audio output, 6AK6 plate to 600-ohm line (V106 output)
T109	71-30953	337106-15	Transformer, audio output, 6AK6 plate to 3.5 ohm speaker. (V107 output)
			TERMINAL BOARDS
TB101	71-30982	441607-20	Terminal board, 21 terminals. H. B. Jones #21-140Y
TB102	71-31082	8893711-3	Terminal board, 3 terminals. Cinch #1783
TB103	71-31095	441607-19	Terminal board, 20 terminals
TB104	71-30981	441607-18	Terminal board, 19 terminals
TP101	71-31076	8825493-2	Jack, tip, red. Johnson #105-602-1
			TUBES
V101			Tube, electron, RCA type 6U8 (audio amplifier, microphone amplifier)
V102			Tube, electron, RCA type 6AL5 (speech clipper)
V103			Tube, electron, RCA type 12AT7 (Tone oscillator)
V104			Tube, electron, RCA type OD3/VR150 (Voltage regulator)
V105			Tube, electron, RCA type OA3/VR75 (Voltage regulator)
V106			Tube, electron, RCA type 6AK6 (LINE output)
V107			Tube, electron, RCA type 6AK6 (SPKR/HANDSET audio output)
			TUBE SOCKETS
XV101	71-31008	737870-20	Socket, tube, miniature, 9-pin
XV102	71-31007	737867-20	Socket, tube, miniature, 7-pin
XV103	71-31008	737870-20	Socket, tube, miniature, 9-pin
XV104	71-30942	99391-2	Socket, tube, octal
XV105	71-30942	99391-2	Socket, tube, octal
XV106	71-31007	737867-20	Socket, tube, miniature, 7-pin
XV107	71-31007	737867-20	Socket, tube, miniature, 7-pin

SSB-1 MARK IV - POWER SUPPLY SECTION

Symbol	Stock No.	Drawing No.	Description
MISCELLANEOUS MECHANICAL PARTS			
MP103		1048673-501	Panel assy.
MP104		347357-3	Brace
MP105		347357-2	Brace
MP106		1044238-3	Handle
MP108		1043162-1	Speaker grille
MP109		1043279-1	Bracket, fuse holder
MP110		347360-1	Cabinet slide
MP111		347360-2	Cabinet slide
MP114		1043115-1	Handset hanger. Western Electric #KS-10080-2
MP115	71-30986	480374-3	Knob, skirted, round. Raytheon Mfg. Co. #90-3-2G
MP123		1044273-1	Plate, duplex

(*) ITEMS USING MORE THAN ONE OF SAME COMPONENT

Symbol	Quan.	Symbol	Quan.	Symbol	Quan.
C112	3	DS103	5	R257	2
C117	3	DS201	2	R258	9
C131	3			R259	16
C201	2	K201	2	R303	4
C203	2			R308	3
C205	4	L203	2	R313	3
C209	2	L205	2	R320	2
C211	2	L207	2	R322	7
C213	75	L209	2	R331	8
C217	4	L212	2	R345	2
C220	3	L214	2	R353	2
C223	3	L216	2		
C229	2	L217	3	T101	2
C232	4			T201	2
C237	3	R102	5	T202	2
C239	3	R109	2	T205	3
C242	2	R128	3		
C263	4	R131	2	TP201	6
C269	2	R144	2		
C301	4	R155	2	XV201	9
C303	4	R201	4	XV204	15
C316	4	R203	3	XV205	10
C318	2	R206	3		
C320	2	R207	9	E201	3
C324	3	R209	6		
C333	7	R210	4	S102	2
C340	2	R211	2	S105	2
C343	2	R213	7		
C361	3	R219	7		
C372	2	R221	12		
C381	2	R224	2		
C389	2	R231	17		
		R241	3		
CR102	24	R248	2		
CR201	3	R251	3		
CR204	5	R255	2		

TUBES

6146-3	6BE6-4
6AL5-4	6BA6-4
6CL6-3	6U8-1
12AT7-4	6AK6-2
12AX7-3	0A3/VR75-1
	0D3/VR150-1

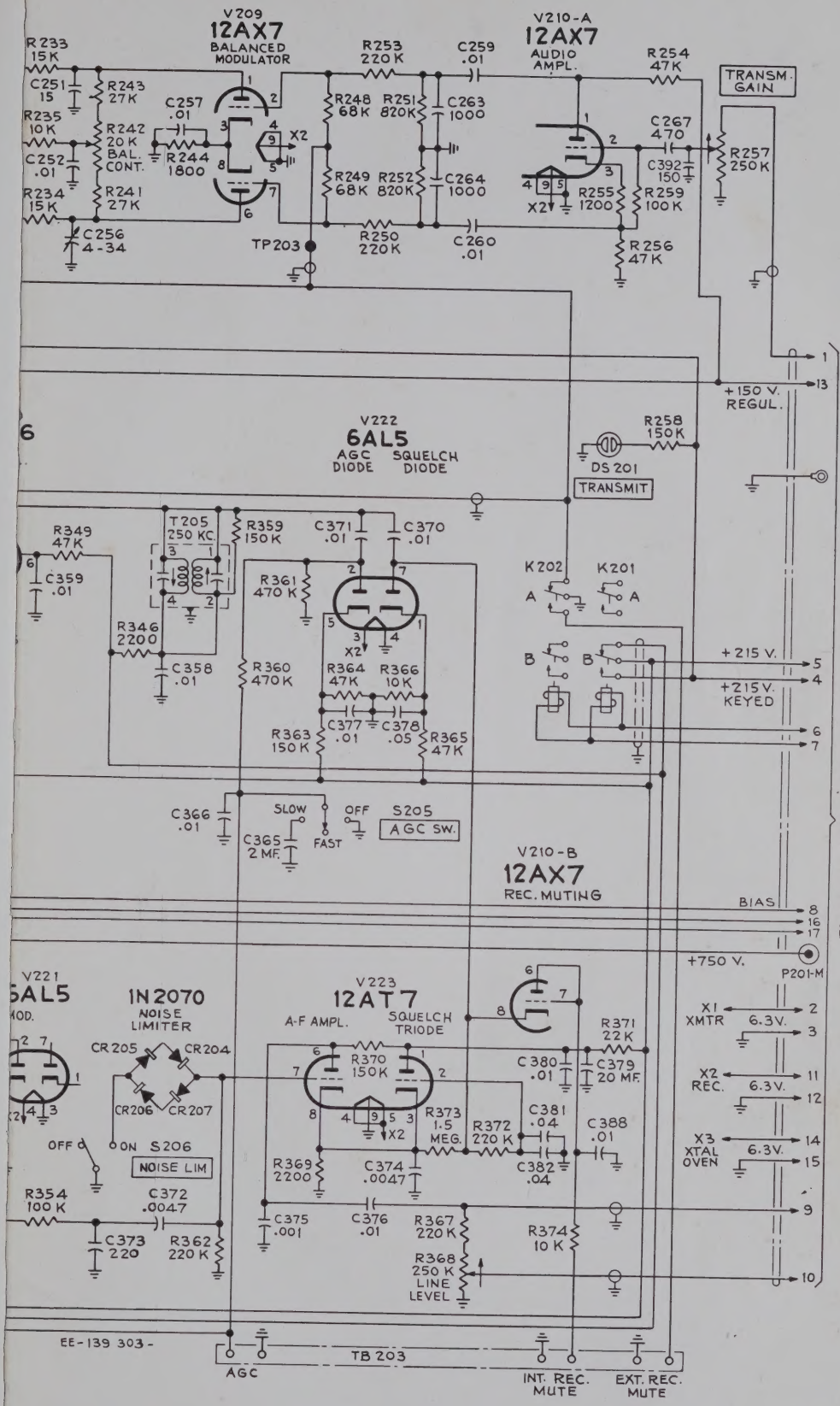


Fig. 89—Schematic Diagram, Transmitter/Receiver Unit, SSB-1 Mark IV

SSB-1 MARK IV - POWER SUPPLY SECTION

Symbol	Stock No.	Drawing No.	Description
MISCELLANEOUS MECHANICAL PARTS			
MP103		1048673-501	Panel assy.
MP104		347357-3	Brace
MP105		347357-2	Brace
MP106		1044238-3	Handle
MP108		1043162-1	Speaker grille
MP109		1043279-1	Bracket, fuse holder
MP110		347360-1	Cabinet slide
MP111		347360-2	Cabinet slide
MP114		1043115-1	Handset hanger. Western Electric #KS-10080-2
MP115	71-30986	480374-3	Knob, skirted, round. Raytheon Mfg. Co. #90-3-2G
MP123		1044273-1	Plate, duplex

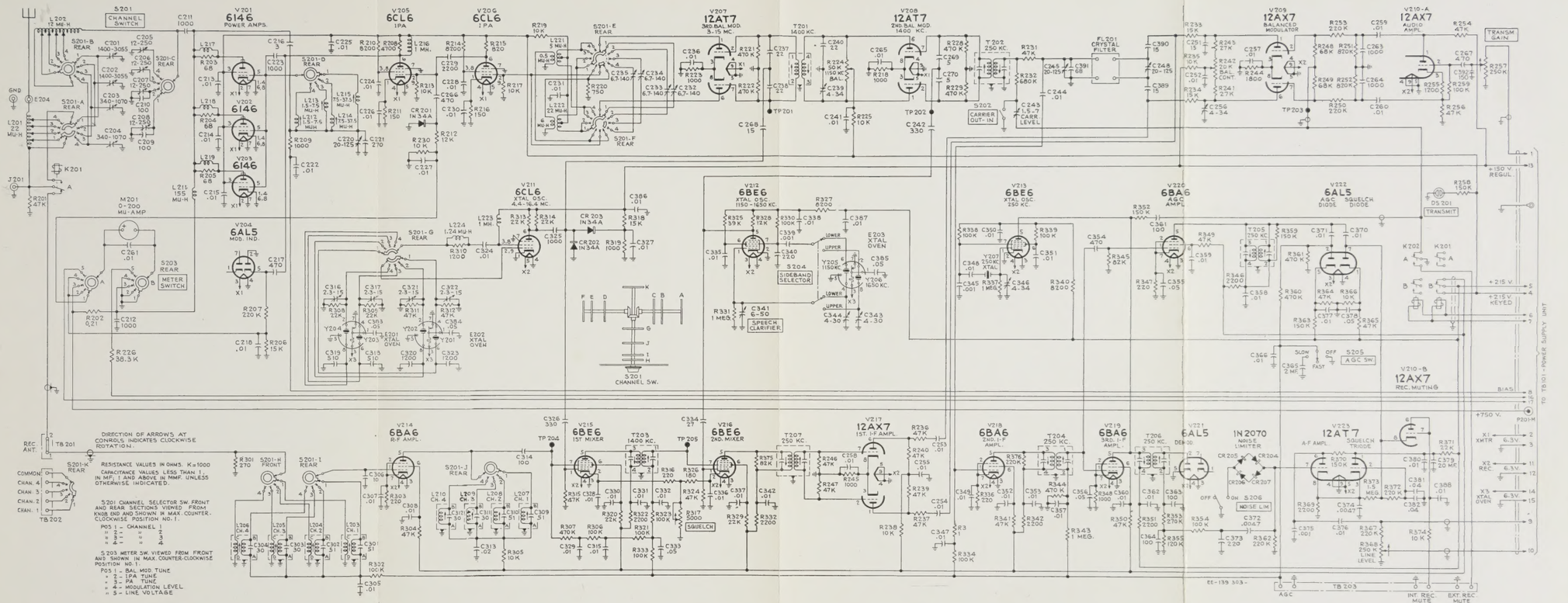
(*) ITEMS USING MORE THAN ONE OF SAME COMPONENT

Symbol	Quan.	Symbol	Quan.	Symbol	Quan.
C112	3	DS103	5	R257	2
C117	3	DS201	2	R258	9
C131	3			R259	16
C201	2	K201	2	R303	4
C203	2			R308	3
C205	4	L203	2	R313	3
C209	2	L205	2	R320	2
C211	2	L207	2	R322	7
C213	75	L209	2	R331	8
C217	4	L212	2	R345	2
C220	3	L214	2	R353	2
C223	3	L216	2		
C229	2	L217	3	T101	2
C232	4			T201	2
C237	3	R102	5	T202	2
C239	3	R109	2	T205	3
C242	2	R128	3		
C263	4	R131	2	TP201	6
C269	2	R144	2		
C301	4	R155	2	XV201	9
C303	4	R201	4	XV204	15
C316	4	R203	3	XV205	10
C318	2	R206	3		
C320	2	R207	9	E201	3
C324	3	R209	6		
C333	7	R210	4	S102	2
C340	2	R211	2	S105	2
C343	2	R213	7		
C361	3	R219	7		
C372	2	R221	12		
C381	2	R224	2		
C389	2	R231	17		
		R241	3		
CR102	24	R248	2		
CR201	3	R251	3		
CR204	5	R255	2		

TUBES

6146-3	6BE6-4
6AL5-4	6BA6-4
6CL6-3	6U8-1
12AT7-4	6AK6-2
12AX7-3	0A3/VR75-1
	0D3/VR150-1

Ch A1 6.582 mcg. 1/2
Ch A2 75 mg 1/2

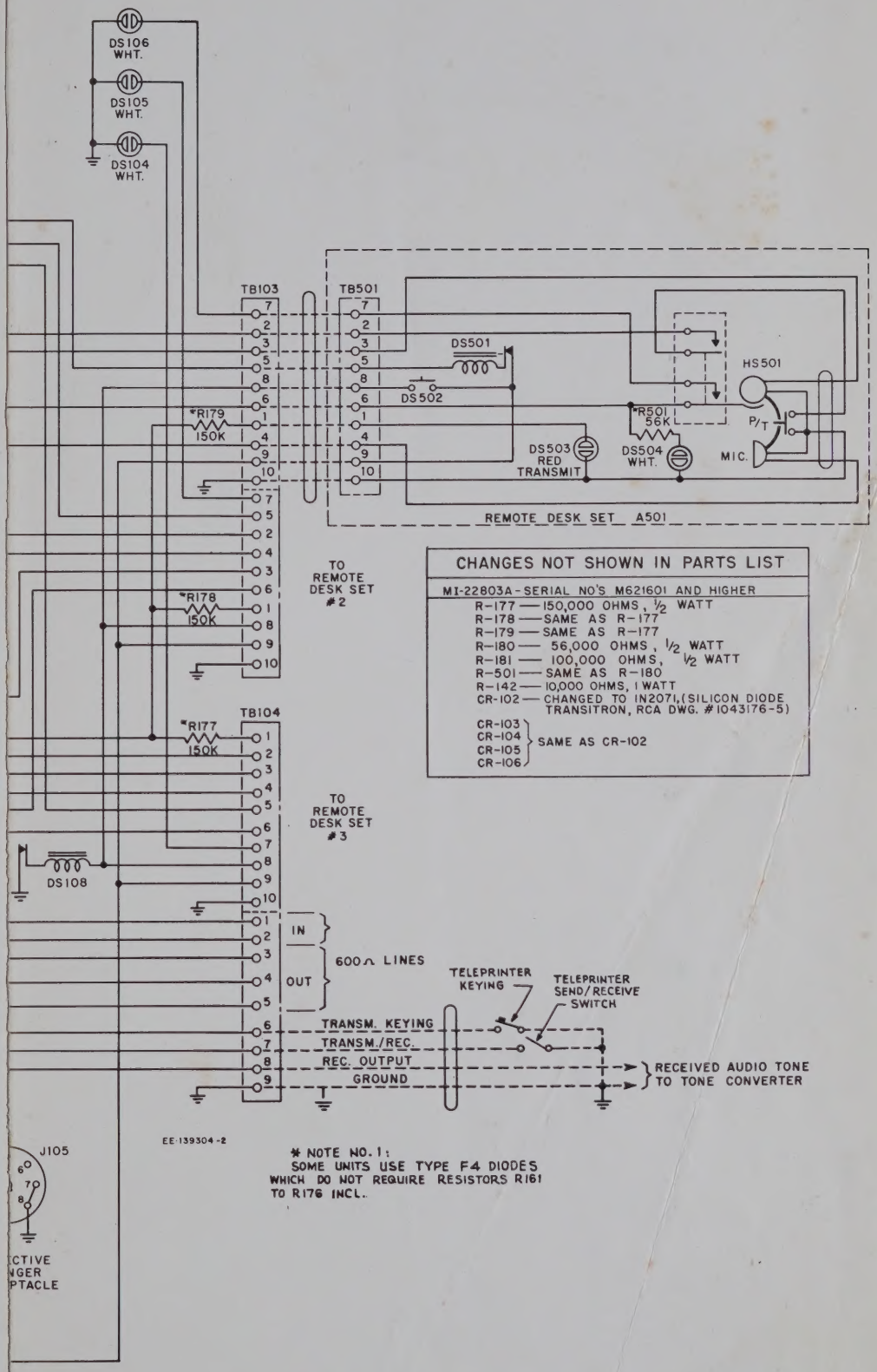


CHANGES NOT SHOWN IN PARTS LIST

MI-228036 SERIAL NO'S MG11601 AND HIGHER

C-246 — NOT USED
C-247 — NOT USED
C-249 — NOT USED
C-250 — NOT USED
C-389 — SAME AS C306
C-390 — SAME AS C306
C-391 — CAPACITOR, MICA, 68 MMF, ±2%, 500 V., RCA DWG #722004-519
C-392 — CAPACITOR, DISC CERAMIC, 150 MMF, ±5%, 500 V., RCA DWG #39167-108
FL-201 — FILTER, CRYSTAL, SNELGROVE TYPE F-250-I-U, RCA DWG #1581122-1
R-335 — NOT USED
R-377 — SAME AS R331

Fig. 89—Schematic Diagram, Transmitter/Receiver Unit, SSB-1 Mark IV



—Schematic Diagram, Power Supply and Audio Unit, SSB-1 Mark IV

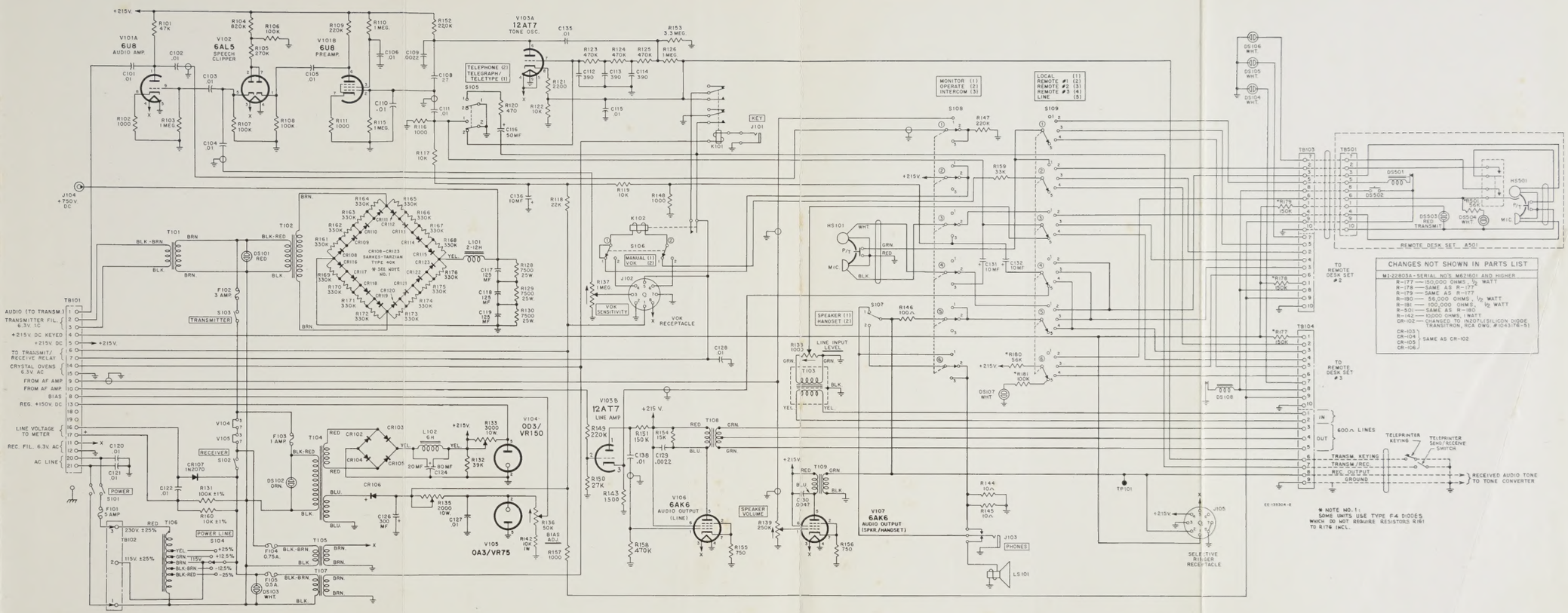
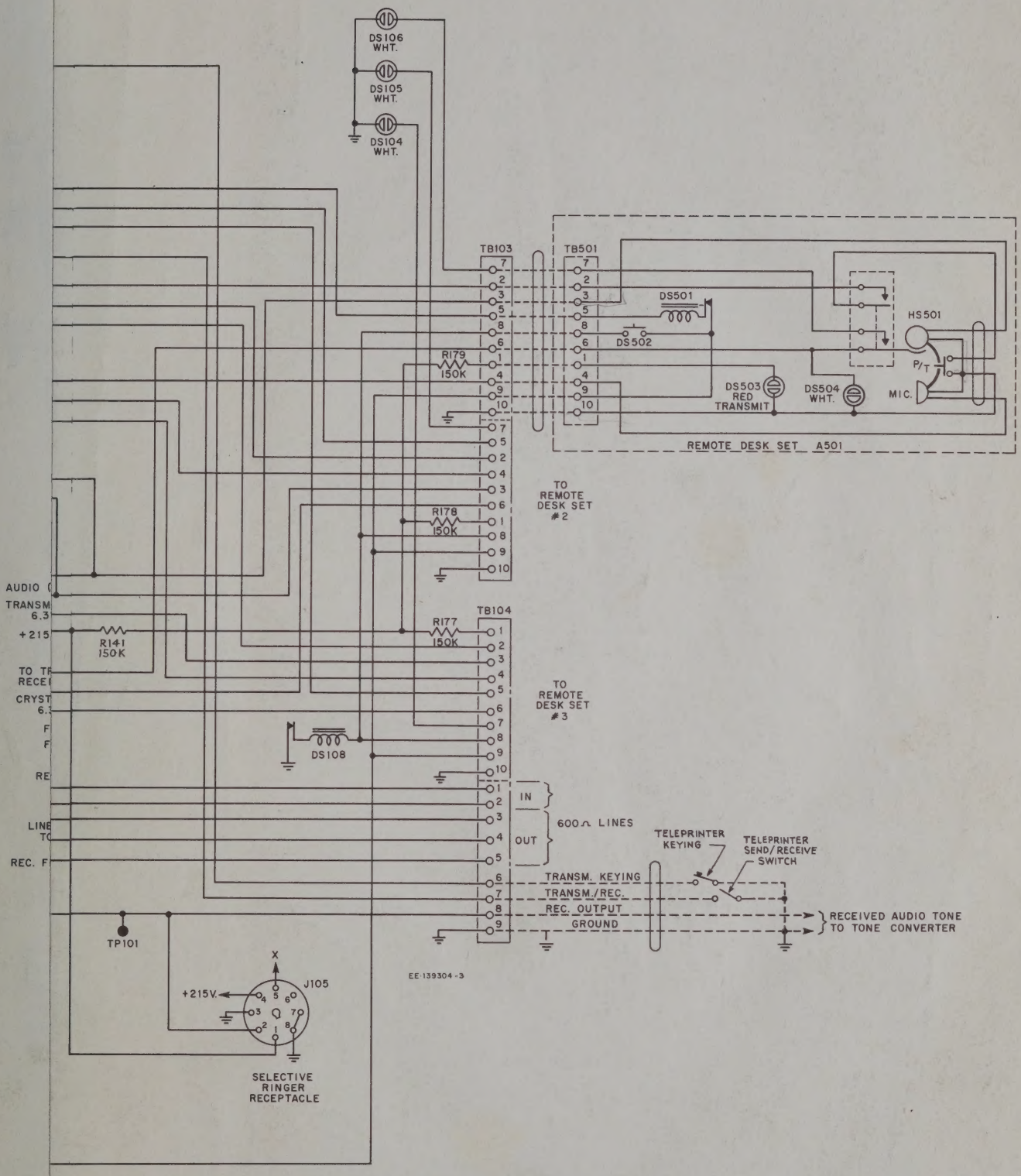
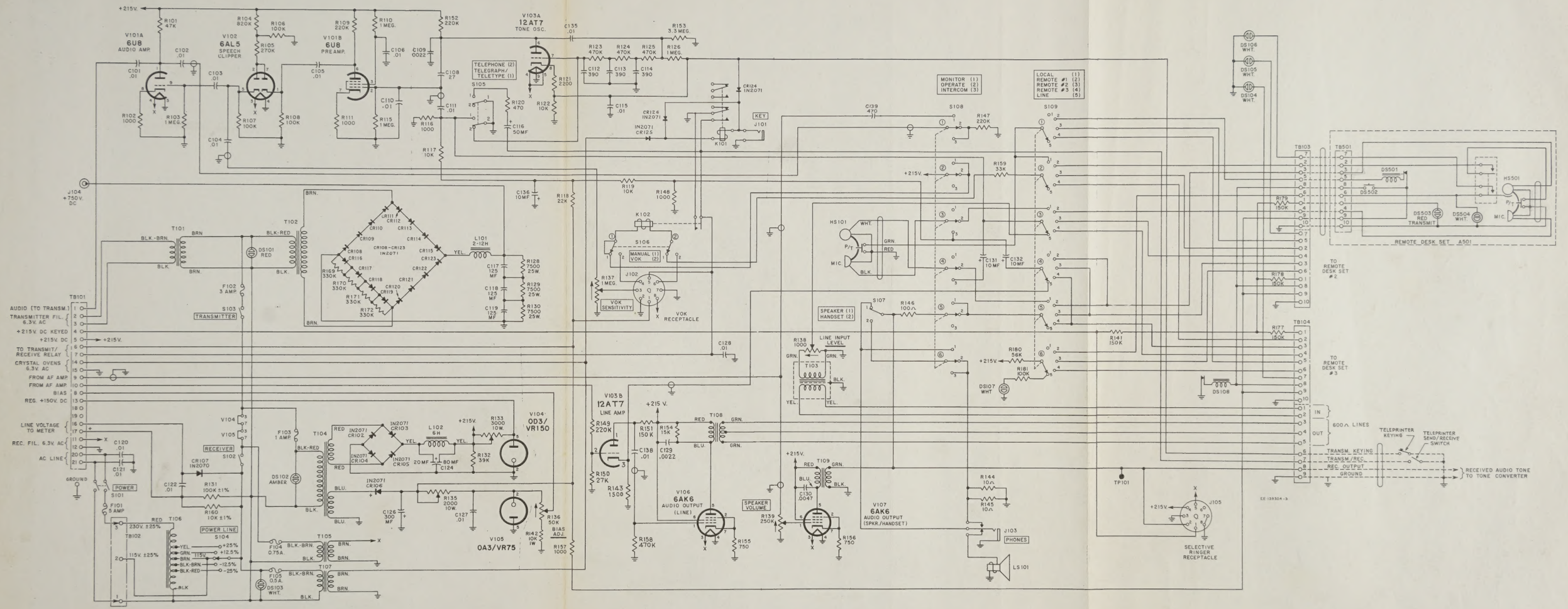


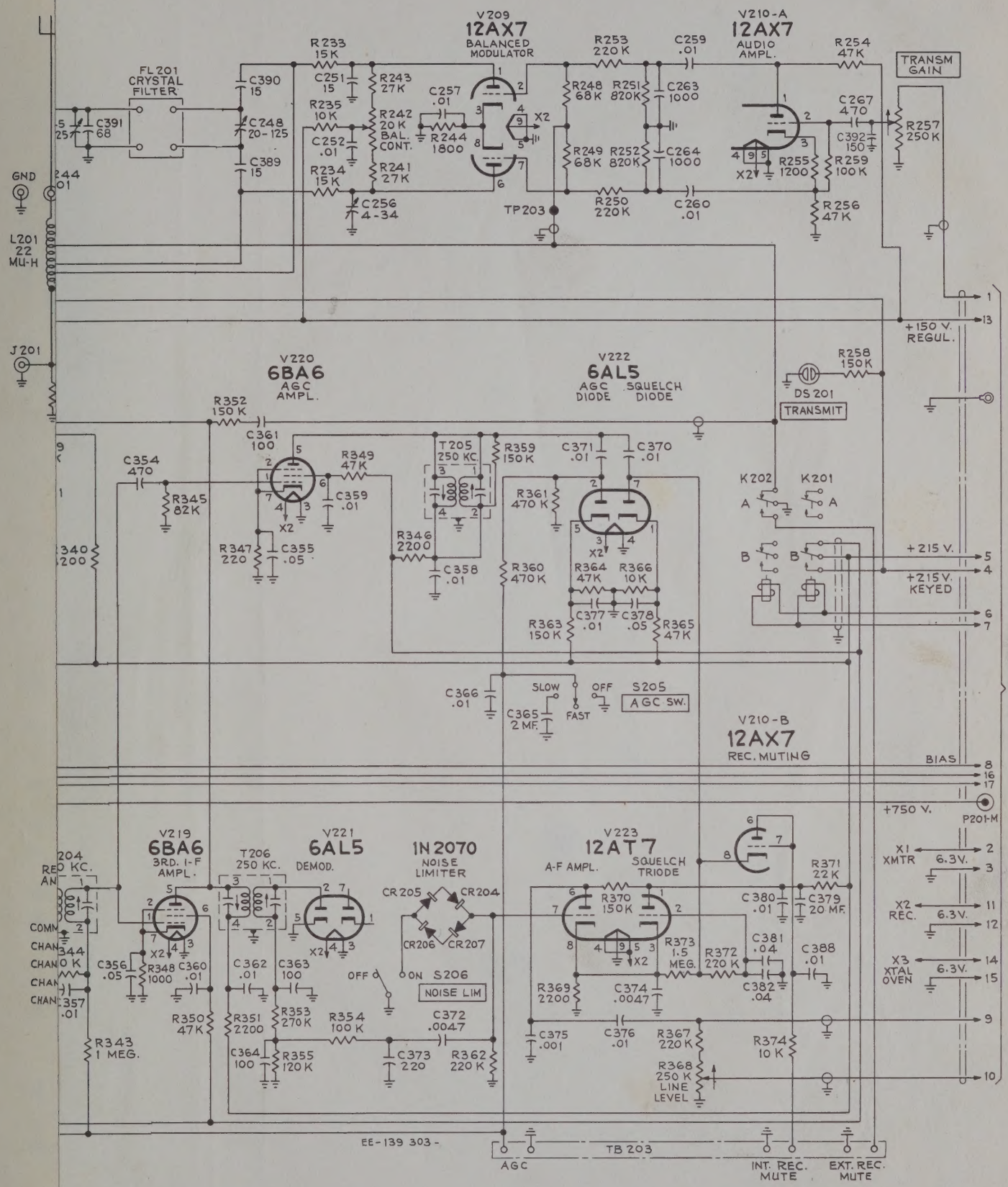
Fig. 96.—Schematic Diagram, Power Supply and Audio Unit, SSB-1 Mark IV



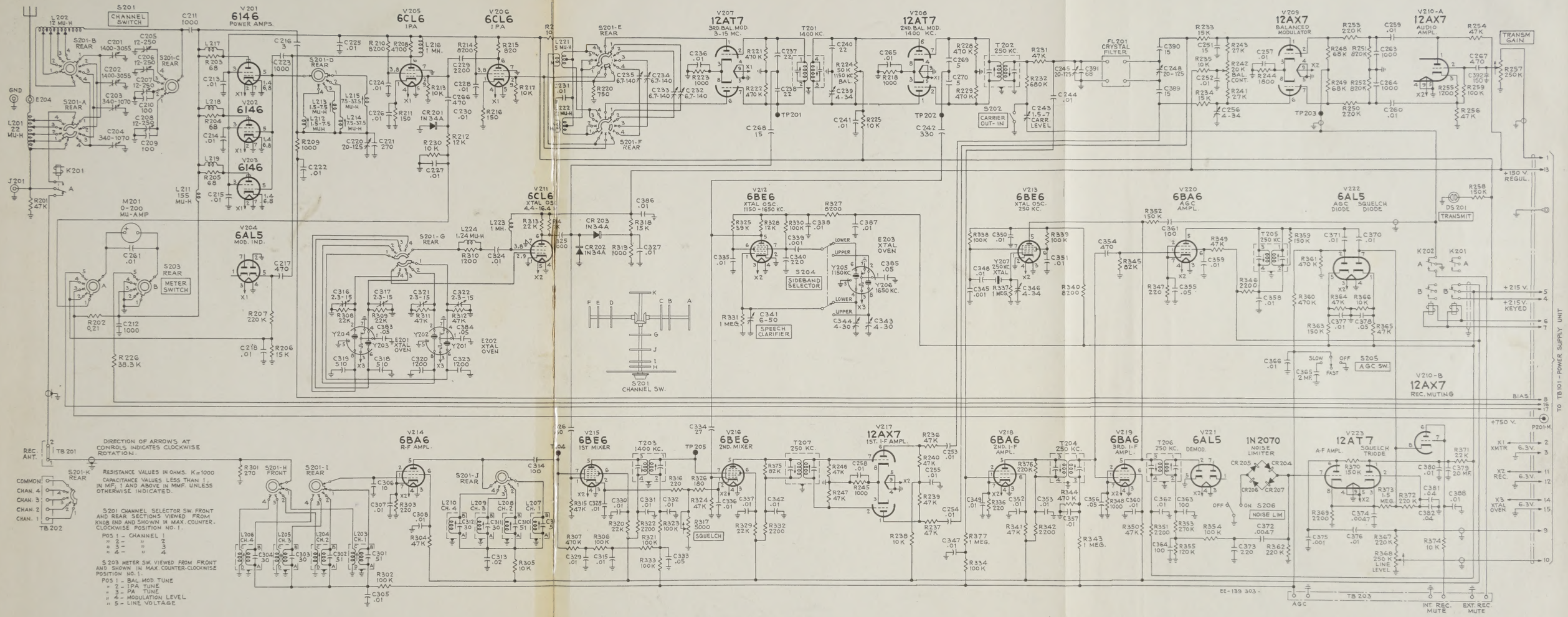
Schematic Diagram Power Supply Unit



Schematic Diagram Power Supply Unit



Schematic Diagram Transmitter/Receiver Unit



Schematic Diagram Transmitter/Receiver Unit

PRIMEROS AUXILIOS EN CASOS DE ELECTROCUCION

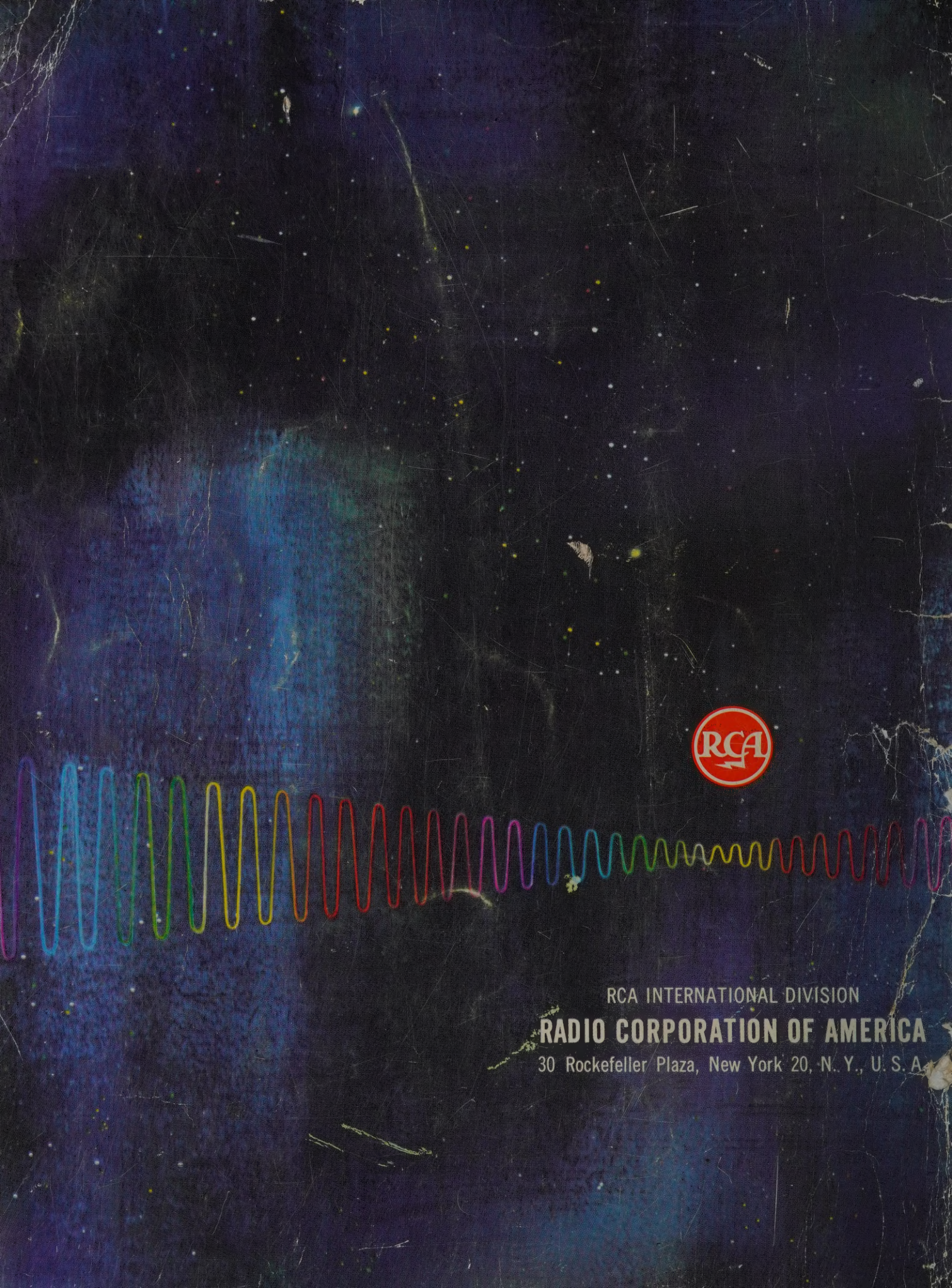
1. PROTEJASE con material aislante seco.
2. CORTE EL CIRCUITO abriendo el interruptor o separando a las víctima del conductor "vivo". NO LA TOQUE CON LAS MANOS DESNUDAS hasta que no se haya cortado el circuito.
3. APLIQUELE RESPIRACION ARTIFICIAL IMMEDIATAMENTE, LOS SEGUNDOS CUENTAN. No se demore buscando ayuda o aflojando la ropa, abrigando o aplicando estimulantes a la víctima.

4. COLOQUE LA VICTIMA BOCA ABAJO, preferiblemente con la cabeza más baja que los pies.
5. QUITELE TODA OBSTRUCCION o cuerpo extraño de la boca, tírele la lengua hacia afuera.
6. COLOQUELE LA FRENTE sobre las manos cruzadas.
7. APOYESE SOBRE UNA RODILLA frente a la cabeza de la víctima (ver la figura A).
8. COLOQUELE LAS PALMAS DE LAS MANOS sobre la espalda, a la altura de la línea de las axilas, con los dedos separados y los pulgares cinco centímetros de distancia entre sí (ver la figura A).
9. EXTIENDA LOS BRAZOS Y MUEVA EL CUERPO LENTAMENTE HACIA ADELANTE, hasta que queden los brazos verticales (ver la figura B). No ejerza presión superior a 35 libras (15 kilogramos).
10. MUEVA EL CUERPO LENTAMENTE HACIA ATRAS, para aflojar la presión.
11. TOME LOS BRAZOS DE LA VICTIMA por encima de los codos y continúe el movimiento hacia atrás (ver la figura C).
12. LEVANTE LOS BRAZOS DE LA VICTIMA hasta que se sienta tensión (ver la figura D).
13. BAJELE LOS BRAZOS, para completar el ciclo.
14. DESPUES DE DOS SEGUNDOS, COMIENCE NUEVAMENTE con el paso 6.
15. REPITA EL CICLO 12 ó 15 veces por minuto.
16. MIENTRAS CONTINUA CON LA RESPIRACION ARTIFICIAL PIDA A ALGUIEN QUE:
    a) Afloje la ropa de la víctima
    b) Llame a un médico
    c) Conserve a la víctima abrigada
17. PERSISTA. Continúe sin interrupción hasta que la víctima respire espontáneamente, o hasta que se constate que ha muerto. A veces pueden necesitarse hasta cuatro horas, o más, para revivir a un electrocutado.
18. PERMANEZCA EN POSICION aún después de revivida la víctima. Esté listo para reanudar la respiración artificial si fuera necesario.
19. NO SUMINISTRE LIQUIDOS A LA VICTIMA MIENTRAS ESTE INCONSCIENTE.

SOINS DE PREMIERE URGENCE EN CAS D'ELECTROCUTION

1. SE PROTEGER au moyen d'une matière isolante sèche.
2. COUPER LE COURANT, soit en ouvrant l'interrupteur, soit en dégageant le sujet du conducteur en charge. NE PAS TOUCHER LE SUJET AVEC LES MAINS NUES tant que le courant n'est pas coupé.
3. PRATIQUER IMMEDIATEMENT LA RESPIRATION ARTIFICIELLE, LES SECONDES COMPTENT. Commencer aussitôt, avant même de chercher de l'aide, avant de desserrer les vêtements du sujet, de le réchauffer ou de lui administrer des stimulants.

4. COUCHER LE SUJET A PLAT VENTRE, de préférence avec la tête plus basse que les pieds.
5. DEGAGER LA BOUCHE DE TOUTE OBSTRUCTION ou de tous corps étrangers; tirer la langue vers l'avant.
6. PLACER LE FRONT DU SUJET sur ses mains croisées.
7. S'AGENOUILLER A LA TETE DU SUJET, sur l'un des deux genoux. (Voir A.)
8. POSER LES MAINS, les paumes en dessous de la ligne des aisselles, les doigts écartés et les pouces à cinq centimètres environ l'un de l'autre. (Voir A.)
9. LES BRAS TENDUS, PIVOTER lentement EN AVANT jusqu'à ce que les bras soient à la verticale. (Voir B.) Ne pas exercer une pression de plus de 15 kg.
10. REVENIR LENTEMENT EN ARRIERE pour relâcher la pression.
11. SAISIR LES BRAS DU SUJET juste au dessus des coudes et continuer le mouvement en arrière. (Voir C.)
12. SOULEVER LES BRAS jusqu'à ce qu'une tension se manifeste. (Voir D.)
13. ABAISSER LES BRAS pour compléter le cycle.
14. APRES UNE PAUSE DE DEUX SECONDES, RECOMMENCER comme décrit à l'alinéa 6.
15. RECOMMENCER à raison de 12 à 15 cycles par minute.
16. PENDANT QUE LA RESPIRATION ARTIFICIELLE CONTINUE, DEMANDER A UN AIDE:
    a) De desserrer les vêtements du sujet,
    b) D'appeler un médecin,
    c) De réchauffer le sujet.
17. NE PAS PERDRE COURAGE. Continuer sans interruption jusqu'à ce que le sujet respire sans aide ou que la mort soit constatée.
    Il peut être nécessaire de continuer la respiration artificielle pendant quatre heures ou plus.
18. RESTER EN POSITION après réanimation, afin d'être prêt à reprendre la respiration artificielle en cas de nécessité.
19. N'ADMINISTRER AUCUN LIQUIDE PENDANT QUE LE SUJET EST INCONSCIENT.



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